











BURMA,  
ITS  
PEOPLE AND PRODUCTIONS;  
OR,  
NOTES ON THE FAUNA, FLORA AND MINERALS  
OF  
TENASSERIM, PEGU AND BURMA.

BY  
REV. F. MASON, D.D., M.R.A.S.,  
CORRESPONDING MEMBER OF THE AMERICAN ORIENTAL SOCIETY, OF THE BOSTON SOCIETY OF  
NATURAL HISTORY, AND OF THE LYCEUM OF NATURAL HISTORY, NEW YORK.

VOL. I.  
GEOLOGY, MINERALOGY  
AND  
ZOOLOGY.

REWRITTEN AND ENLARGED  
BY  
W. THEOBALD,  
LATE DEPUTY-SUPERINTENDENT GEOLOGICAL SURVEY OF INDIA.

PUBLISHED BY ORDER OF THE CHIEF COMMISSIONER OF  
BRITISH BURMA,

BY  
STEPHEN AUSTIN & SONS, HERTFORD.

---

1882.

1738  
1883  
v. 1

STEPHEN AUSTIN AND SONS,



PRINTERS, BIRMINGHAM.

## PREFACE TO THE PRESENT EDITION.

BY THE EDITOR OF THE ZOOLOGICAL AND BOTANICAL PORTIONS.

---

THE Chief Commissioner of British Burma having determined to bring out a new edition of Dr. Mason's work, placed the manuscripts of the Zoological and Botanical portions in my hands for the purpose of arranging a thoroughly revised Edition. The MSS. in question consisted of various emendations of the printed text, and a very heterogeneous mass of scraps and cuttings, accumulated by my late friend before his death, but which were certainly not all of them intended for publication, but rather as materials for the preparation of an edition he never lived to bring out. Under these circumstances I accepted the office, with the understanding that the work was to be completely rewritten by myself, as that I saw was the only way it was possible properly to amalgamate such a mass of material, and hence the different arrangement of the present edition from that adopted in the previous ones. Indeed, I had no choice in the matter; for several branches of the subject had since been so fully investigated, that the task before the compiler of any new edition of Dr. Mason's work was not so much to incorporate the new materials with the old, as to combine the old materials with the actually larger and fuller accessions to our knowledge of subsequent date; and as Dr. Mason himself did not so much claim to be an original observer in the various branches of natural history, as the historian of the labours of other workers in its several departments, I felt that the task I proposed to myself was merely the task that Dr. Mason would himself have undertaken had he been spared thereto, though of course the charm of the popular style of Dr. Mason's writing would be lost, in the execution of the work by another pen.

As so much of Dr. Mason's distinctive style will of necessity disappear in the body of the work, it has been deemed advisable to append the original prefaces of the earlier Editions, wherein my deceased friend explains the origin of the work, and justifies even an imperfect attempt to meet a pressing and undoubted want.

In the Botanical portion of the work I have to acknowledge the friendly and valuable assistance I have received from the Revd. C. Parish, to whom I am indebted for the Catalogues of Orchids, Ferns, Mosses, Lichens, Fungi, and Algæ, which have been arranged and mostly written by himself. The substance of the work may be described as mainly derived from the Papers on Burmese Plants contributed by Kurz to the Journal of the Asiatic Society of Bengal, and the Forest Flora of British Burma by the same author. I have also consulted the fine work of Le Maout and Decaisne on Descriptive and Analytical Botany, translated by Mrs. Hooker and edited by Sir J. D. Hooker, C.B.; Balfour's Forest Trees; and the Cyclopædia of India, embodying the researches of Brandis, and numerous other authorities, which need not here be quoted at length.

W. THEOBALD,

DEPUTY SEPT. GEOLOGICAL SURVEY OF INDIA.

LIME HOUSE, *Oundle*, 1882.

# CONTENTS OF VOLUME I.

	PAGE
Title and Preface by the Editor of the Present Edition . . . . .	i
Title and Preface of the First Edition by the Author . . . . .	vii
Title and Preface of the Second Edition by the Author. . . . .	xix

## GEOLOGY

Metamorphic Rocks—Mergui Group—Maulmain Group—Triassic Group—Cretaceous Group—Nummulitic Group—Siwalik Group—Recent Deposits—Intrusive Rocks—Volcanoes and Mud Volcanoes . . . . .	1-8
--	-----

## MINERALOGY.

Group I. Native Elements—Group II. Sulphides, Arsenides—Group III. Chlorine Compounds—Group IV. Fluorine Compounds—Group V. Oxygen Compounds—Group VI. Hydrocarbon Compounds . . . . .	8-15
--	------

## ZOOLOGY.

PROTOZOA.—FORAMINIFERA . . . . .	16-17
CELENTERATA.—SPONGIA—HYDROZOA—ACTINOZOA . . . . .	17-19
ECHINODERMATA.—CRINOIDEA—STELLARIDEA—ECHINOIDEA—HOLOTHURIOIDEA . . . . .	19-20
VERMES.—PLATYELMINTHA—NEMATHELMINTHA—ANNELIDA . . . . .	20-23
ARTHROPODA.—CRUSTACEA—MYRIAPODA—ARACHNIDA—INSECTA . . . . .	23-122
CONCHOLOGY.—Preface . . . . .	123
MOLLUSCA.—BRACHYPODA—LAMELLIBRANCHIATA—PTEROPODA—GASTEROPODA—CEPHALOPODA . . . . .	124-182
VERTEBRATA . . . . .	183
ICHTHYOLOGY.—Preface . . . . .	183-188
PISCES.—TELEOSTEI . . . . .	188-283
CHONDROPTERYGII . . . . .	283-217
HERPETOLOGY . . . . .	288
AMPHIBIA.—OPHIOMORPHA, <i>Blind worms</i> —URODELA, <i>Newts</i> . . . . .	288-289
BATRACHIA, <i>Frogs, Toads</i> . . . . .	289-296
REPTILIA.— . . . .	297
OPHIDIA—Harmless Snakes . . . . .	297-308
Venomous Snakes . . . . .	308-322
Directions for discriminating poisonous Snakes . . . . .	322-326
SAURIA—Lizards . . . . .	326-335
LORICATA—Crocodiles . . . . .	335
CHELONIA—Turtles . . . . .	335-344

	PAGE
ORNITHOLOGY.—Preface . . . . .	345
AVES.—PICI—Woodpeckers . . . . .	346-349
VOLITORES—Barbets—Hornbills—Kingfishers—Trogon—Goat-suckers—Swallows—Swifts . . . . .	349-358
SCANSORES—Cuckoos . . . . .	358-360
PASSERES—Honey-suckers—Creepers—Ant-thrushes—Fly-catchers—King-crows—Shrikes—Thrushes—Warblers—Wrens—Tits—Weaver-birds—Finches—Larks—Starlings—Orioles—Crows . . . . .	360-387
COLUMBE—Pigeons and Doves . . . . .	387-389
GALLINAE—Gallinaceous birds . . . . .	389-392
GRALLAE—Bustards—Plovers—Rails—Waders . . . . .	392-398
ANSERES—Ducks—Geese—Grebes—Gulls—Terns—Pelicans—Cormorants . . . . .	398-402
RAPTORES—Vultures—Eagles—Hawks—Owls . . . . .	402-408
PSITTACI—Parrots—Lories . . . . .	408-410
MAMMALIA.— . . . .	411
BRUTA—Pangolins—Squirrels—Flying Squirrels—Rats—Mice—Porcupines—Hares . . . . .	411-423
CHIROPTERA—Bats . . . . .	423-439
INSECTIVORA—Moles—Shrews—Hedgehogs—Flying Lemmings . . . . .	439-444
CETACEA—Whales—Porpoises . . . . .	444-446
SIRENIA—Dugongs . . . . .	446
PROBOSCIDEA—Elephants . . . . .	446-451
UNGULATA—Rhinoceros—Tapirs—Pigs—Mouse Deer—Stags—Goats—Bovines . . . . .	451-462
CARNIVORA—Bears—Badgers—Otters—Weasels—Dogs—Civets—Paradoxures—Cats . . . . .	462-473
PRIMATES—Lemurs—Monkeys—Men . . . . .	474-484
APPENDIX A.—Polar Bears in Turkestan . . . . .	485
Nāt-Mee, or the Spirit-Fire. . . . .	486-490
Remarks on <i>Heteropsammia</i> . . . . .	490-492
NEPHTYA BURMAENSIS . . . . .	492
Musical Fish . . . . .	492-496
The Mhor or Great Basking Shark . . . . .	496-497
Pristis, size of snout . . . . .	497
Catalogue of Batrachia Salientia, by George Albert Boulenger . . . . .	497-501
Picus canicapillus, Cissa magnirostris, Corvus splendens . . . . .	501-502
Palaornis vibrissa—The Reviewer Reviewed . . . . .	502-504
Loriculus vernalis . . . . .	504
Celts . . . . .	504-506
APPENDIX B.—Vernacular Names . . . . .	507-516
APPENDIX C.—Glossary of Zoological Terms . . . . .	517-520
INDEX . . . . .	521-560

*(Title and Preface to the First Edition.)*

THE  
NATURAL PRODUCTIONS OF BURMAH;  
OR,  
NOTES  
ON THE  
FAUNA, FLORA AND MINERALS  
OF  
THE TENASSERIM PROVINCES  
AND  
THE BURMAN EMPIRE.

BY

REV. FRANCIS MASON, A.M.,

CORRESPONDING MEMBER OF THE BOSTON SOCIETY OF NATURAL HISTORY, AND OF THE  
LYCEUM OF NATURAL HISTORY, NEW YORK.



MAULMAIN :  
AMERICAN MISSION PRESS.  
THOS. S. RANNEY.  
1850.





# PREFACE

(TO THE FIRST EDITION).

---

THIS work owes its origin to the wants experienced by a translator of the Bible.

Ever since the day that man was set to dress the garden of Eden and to give "names to all cattle, and to the fowl of the air and to every beast of the field," he has in every age and every clime been a lover of nature. It has been remarked of the Hebrews, especially, that "they make such frequent recurrence, for metaphorical expressions, to natural objects, and particularly to plants and trees, that their poetry may almost be termed the botanical poetry." The Hebrew and Greek Testaments contain between seven and eight hundred names of natural productions found in the countries where the books were written, and Michaelis says "there are upwards of two hundred and fifty botanical terms." These names and terms enter into many thousands of verses, THE PROPER RENDERING OF WHICH DEPENDS UPON A CORRECT KNOWLEDGE OF THE THINGS DESIGNATED. And how much more lucid and interesting will appear the Book of God if these terms be rightly translated!

Throughout the inspired writings of the ancient Scriptures and in all the teachings of the Apostles we find constant allusion to the works of nature. And our Saviour in his parables and similitudes continually draws from the natural scenes of the earth which his almighty hand had fashioned, that "the invisible things of Him from the creation of the world might be clearly seen, being understood by the things that are made." But had his hearers been unacquainted with the peculiar names and properties of the plants or animals to which he referred, they could never have felt as they did the overwhelming power of his arguments and illustrations. And yet by some translators, a very considerable proportion of the botanical and zoological names that occur in the Bible are unnecessarily transferred! "Not being a zoologist, botanist, or mineralogist," wrote a distinguished translator, "I have not unfrequently, in disposing of technical terms, whose meaning I could not satisfactorily settle, gone the whole animal, plant, or mineral, as the case might be, and transferred it."

In this way many words are transferred for which there are good vernacular names, and a native has in his word a barbarous word that conveys no idea, while, it may be, the original word designates a flower that is waiting its fragrance within the lattice where he sits reading. This is no fancy sketch. The camphire of the English Bible, the exquisitely fragrant *Laursonia inermis* or henna, is rendered in one Indian version by camphor, and in another the name is transferred, while the shrub itself is growing by the doors of myriads of native houses in both Indias, and for which there are established vernacular names in every Indian language to which I can refer.

Such transfers always cast a deep shadow over the signification of the passage in which they occur, and sometimes wrap it in impenetrable darkness. For instance, Christ says to the Scribes and Pharisees, "Ye pay tithe of mint and anise and cummin and have omitted the weightier matters of the law, judgment, mercy and faith." Here the antithesis can only be seen by a knowledge of the trilling character of mint, anise and cummin, yet in two Indian versions every one of these names is transferred, which renders the clause, without a paraphrase, as unintelligible as the English Bible would be with as many Choctaw words in their place. Still nothing could be more unnecessary, for the readers of the version are nearly as familiar with mint, anise and cummin as the people of Europe, and have as well established names for them in their language.

In two versions made several thousand miles apart, the translators transferred the original word for wood-aloes, although the people for whom they wrote were well acquainted with it, and there were good terms in the languages in which they were translating by which to render the word, but of both facts the translators were manifestly ignorant.

These examples, which might be easily multiplied, illustrate the advantages which a translator with some knowledge of the natural sciences possesses in dealing with the Word of God. But the reader asks, Why need he enter scientifically into these studies? Why does he not take the lexicons and other helps prepared for him?

Many are the admirers of nature, but let it not be supposed that all are her observing students. The pages of learned men in Europe and America, who have incidentally written upon natural history, prove that they are not.

Rosenmüller is the author of the best work extant on the botany of the Bible, yet his unskilful treatment of the subject sufficiently attests his slight knowledge of the science. His descriptions are usually ill-written, and bring before the eye of the reader no definite picture. They are often, moreover,

very defective, giving popular names, as beans and lentils, which are indefinite and applicable to different species, and even to different genera, without the systematic names, which alone are definite and enable a translator to render accurately.<sup>1</sup> Occasionally his statements are erroneous. Of agallochum or wood-aloes he says, "There is a species of this tree that grows in the Moluccas called *guro*, Linneus has described it as *Escararia agallocha*." It would perhaps be difficult to find two trees in the whole vegetable kingdom with more opposite properties than these two species. The Burmese are well acquainted with both. Mr. O'Riley observed correctly that "Akyau is a very fragrant and a very scarce wood, of high value with the natives." This is agallochum or wood-aloes. The other is a tree that the Burmese call *tu-yau*, abundant near the sea, the juice of which is said to produce the most intense pain, and often blindness if it enters the eye. From its power to produce blindness, the Karens call it the "blind tree"; and the natives are all of them so much afraid of it that I have sometimes found it difficult to induce my boatmen to pull up beneath its shade.

In Carpenter's Natural History of the Bible, a popular English work, reprinted by Abbott in America, a description of the gecko is given worthy of the days of King Arthur. "It is thus described," says the author, "by Cæpede. Of all the oviparous quadrupeds whose history we are publishing, this is the first that contains a deadly poison. This deadly lizard, which deserves all our attention by his dangerous properties, has some resemblance to the chameleon. The name geckoo imitates the cry of this animal, which is heard especially before rain. It is found in Egypt, India, Amboyna, etc. It inhabits by choice the crannies of half-rotten trees, as well as humid places. It is sometimes met with in houses, where it occasions great alarm, and where every exertion is used to destroy it speedily. Bontius states that its bite is so venomous that if the part bitten be not cut away or burned, death ensues in a few hours."

It is well known in India that the gecko is as harmless as the cricket. I have had them drop from the ceiling upon my naked hand, and hang suspended by the feet from my fingers without the slightest pain or inflammation ensuing.

Stuart on Rev. xxi. 18, says, "The bottom row of foundation stones was jasper, which is of a green transparent colour streaked with red veins." Such a definition of jasper I have never been able to find in any work on mineralogy, and Webster, following Dana, defines it, "An opaque impure variety of quartz, of red, yellow and also of some dull colours."

<sup>1</sup> See too a curious recent illustration in the Appendix, under Marco Polo and Polar bears.

The distinctive character of jasper from other minerals that represent it is, "its opacity." The Greek word as used by the Apostle undoubtedly designated the stone now called heliotrope or bloodstone, a mineral of a remarkably deep rich green and translucent, but spotted with opaque red spots, supposed to be red jasper. There is in it something peculiarly agreeable to the eye above all other precious stones I ever saw, or that probably exist, and with heliotrope inserted in the version, the imagination of every reader would picture to himself a foundation for the Heavenly Jerusalem of the pleasantest stone for the eye to gaze upon that earth can produce.

Murray, in his *Encyclopædia of Geography*, the first work of its class, says, "To the fig tribe belongs the famous banyan of India, commonly called peepul tree, and constantly planted about Hindoo temples (*Ficus religiosa*)." But the famous banyan is not commonly called peepul, but bir, and the peepul is not the banyan, and the tree which is usually planted about Hindu temples is not the banyan, but the peepul, and the banyan is not *Ficus religiosa*, but *Ficus indica*. Again, he remarks, "Far superior to this (the cocoa) in the magnitude of its leaves, of which a single one will shelter twelve men, is the palmyra palm (*Borassus flabelliformis*), which sometimes attains to one hundred feet, while its trunk yields abundantly toddy or palm wine."

It is true the palmyra produces toddy, not however from the trunk, but from the spathes that bear the flowers and fruits; but the leaf of the palmyra is not much larger than a large cabbage leaf, and the reference to the leaf should have been to the great fan palm of Ceylon, *Corypha umbraculifera*, a palm not of the same genus with the palmyra.

In a little book published by the American Tract Society, it is written, "In some hot countries, where water is scarce, travellers obtain a supply from the palm tree," and the statement is illustrated by a very good representation of the common plantain tree with a fine stream of water gushing from an incision that has been made in the trunk.

The writer had probably some confused ideas of the palm producing toddy, or the traveller's tree, handsome urania, which produces water when a leaf is broken off, or of the water vine phytoerene, an immense creeper, that grows on our thirsty mountain sides, which, when dissevered, discharges a large quantity of water, that is a most grateful beverage on a hot day when far above the streams of the valleys.

In one of the elaborate volumes of the United States Exploring Expedition, it is said, "In its wild state the peacock is peculiar to Hindustan," while they are roving wild all over these Provinces, Aracan and the Burman Empire. Webster defines dammer as "a resinous substance

obtained from a species of agathis or dammara, a tree allied to the pines," while here it is obtained from the wood-oil tree family, and a considerable proportion of what Europeans often call dammer is a hard kind of beeswax produced by a bee that builds in hollow trees.

With teachers like these, Europeans and Americans come to India and find themselves in the midst of a fauna and flora with which they are unacquainted. In sections where there are lexicons that define correctly the vernacular names, the difficulty is scarcely felt. In Wilson's Sanscrit Dictionary, for instance, the systematic name of nearly every plant and animal known to the language can be found at once; but if, as in Farther India, the lexicographers are as much in the dark as the inquirer who consults them, he has no alternative but to remain in darkness, or sit down to the patient study of the objects themselves, and to this trial the translator of the Scriptures must address himself, for it is not optional with him, but is a part of his professional duty to render, if possible, every word of the original by its corresponding word in the vernacular, and he is so far wanting in the trust committed to him by the churches or societies whose ambassador he is, if he shrinks from any study requisite to qualify him for the accurate performance of his work.

In ordinary circumstances, the professional duties of most men preclude them from bestowing the time and attention to the natural sciences necessary to enable them to determine accurately the character of the objects of nature with which they are unacquainted. It is not remarkable then that our Chin-Indian literature abounds in error. Throughout India, wherever there is European society, there is found a numerous class of English names incorrectly applied to Indian productions, which almost unavoidably lead the translator or author astray, when unable to make a scientific examination for himself. On this coast, for instance, it has passed from conversation to books published within the last ten years, that turmeric is saffron; the flower of the thorn apple, the trumpet flower; the tamarind tree, the tamarisk, and its timber, iron wood; the ebony tree is the cabbage tree of one author, and the fig tree of another; and ebony not being supposed to exist, though abundant throughout the Provinces, is defined as "a kind of tree." The fennel flower is "a kind of rice"; nettles, "a kind of thorn." Sweet flag, sugar cane; and the date tree is the palmyra palm. Mica is tale; serpentine, jasper; the carnelian, a garnet or ruby; gamboge, realgar, the red sulphuret of arsenic; natron, the carbonate of soda, is saltpetre; the nitrate of potash and antimony is bismuth according to one authority, and James' powder according to another. The porcupine is a hedge-hog; the hedge-hog, a pangolin; the shrew mouse, a musk rat; the sand badger or aretonix, a hyena; barking

deer, porcine deer; the monitor, a guana; and the bloodsucker, a chameleon. The adjutant is a gull; the eagle, a swan; the hornbill, a crane; the sunbird, a skylark; and the grey heron, a water hen.

In a work translated from the Burmese into English, and printed at the expense of Government, the Burmese name of the common wild ox, *Bos sondaicus*, is translated bison; the sambur or rusa deer is elk; barking deer, spotted deer; the eagle is an adjutant; cranes are called *eyrasses*; sunbirds *huan-sok*; a coluber is translated a *long* snake; a crocodile, an alligator; the toad, a "rough frog." Tin in one place is lead; and pewter, or a mixed metal resembling it, is translated "white copper." The Bengal quince is rendered *okshet*; one species of millet, *sap*, another species of millet, barley; barley is translated *mayau* in one place, and *mace* in another; arum is "ping (root)," a species of yam, *thadac*; and the corypha palm, the palmyra palm.

This last error may be supposed to be of little consequence, and yet through it, the whole paragraph in which it occurs becomes false, and illustrates a precisely opposite argument from that for which it is brought. The writer says, "As regards the inheritance like a palmyra tree, it is the nature of this tree not to grow from cuttings or shoots. Having lived its time, it flowers and bears fruit. When the fruit has fallen off, the parent tree dies. After its death each fruit becomes a tree, and continues the family. Whilst the tree was alive, no other tree could be produced; so only on the death of their parents do children inherit." The palmyra tree produces its fruits annually, as regularly as the apple tree, and young trees may be raised from it as easily as from apple seeds, while the parent tree is still living; so, if the comparison proves anything, it proves that children may inherit before the death of the parent, just the converse of that for which the comparison was made. Let however the original word be correctly translated, and no simile can be more striking and appropriate. A corypha palm, after it has borne fruit, lifts its blackened leafless head above all the other trees of the forest, like the dead father of the woods struck by lightning.

Where two or more systematic names are attached to an article in this work, they are, unless the contrary be indicated, the different names by which the same object is designated by different writers. In Zoology, these synonyms have been selected principally from articles published in the *Journal of the Asiatic Society* by Dr. Cantor and Mr. Blyth. In Botany, the first name is the one under which the article will be found in Voigt's Catalogue, if in that work, and in other modern writers; while the second is the Linnean name or the one by which it was described by Roxburgh and by other authors of the old school.

The utility of these synonyms will be best understood by an example.

Gesenius, Rosenmüller, Harris, and other Biblical writers, tell their readers that *copher* designates *Laursonia inermis*, and Dr. Wright, in his Illustrations of Indian Botany, gives a handsome coloured figure of *Laursonia alba*. To a person not read in botany these will be regarded as different species; but on turning to my article, the reader will learn at a glance that they are different names given by different writers to the same plant. Thus it will be seen that our common barking deer lies scattered over the pages of natural history under twelve different names, and without the synonyms, it might be taken for twelve different species. In like manner, when objects have several native names, as they often have, I give all that I have heard.

Still the investigator will not always obtain the object he seeks from the native name, and this is a difficulty which no author can obviate, as it exists in the language. Different objects sometimes have the same name, as, for instance, the goat-sucker and the snipe. The Burmese call both *mge-wote* from their habit of dwelling on the earth. Sometimes a slight distinction is supposed to exist between different things, which is not always observed. The Amherstia and the Jonesia are both *athauka* trees, but the Amherstia is regarded as the female, and the Jonesia as the male tree, which is therefore denominated *athauka-pho*. So the male of the fragrea is the gordonia or *anan-pho*. The same object is often known by different names. Our knowledge of the existence of platina in Burmah was first furnished by Mr. Lane, who said the Burmese called it *sheen-than*, but in his dictionary he defines it *shwe-phyu* or white gold. Some persons make distinctions which others neglect. The water-lily and the nelumbium are both called *kya*, or the *kya* is restricted to the water-lilies and the nelumbium called *pa-dung-ma*. To many obscure species in every department of the natural kingdom the natives have no definite names, on which they can agree among themselves.

The local names used in Tavoy and Aracan are given where known, the latter on the authority of Col. Phayre, from whom also were first derived some of the Burmese names for birds and the smaller mammalia. It is only within the last two years that the proper Burman name for eagle has found its way into books, though it was communicated first by Col. Phayre some eight or ten years ago.

The present work does not explain mere technicalities for the naturalist, but brings to light in the department in which it enters, a host of common English words that have hitherto been left in this country like useless lumber in the shade. To illustrate this position, take a single example from the Ichthyology, in which, for the first time, the correct native names are furnished of the following fish known to English readers: river-perch, cockup, band-fish, umber or sea-perch, Indian whiting, mullet, mango-fish,

climbing perch, snakehead, ophidian, long-snout, doree, pomphret, ribband-fish, goby, carp, barbel, gudgeon, bream, white fish, roach, flat-bellied herring, thryssa-anchovy, bristle-finned sprat, fresh-water herring, flying fish, gar fish, half-billed gar fish, plagusia sole, brachirus turbot, adipose cat fish, short-headed cat fish, eight-barbuled cat fish, long-finned cat fish, two-barbuled cat fish, fork-tailed cat fish, barbuleless cat fish, plotosus cat fish, elarias cat fish, long-headed cat fish, hammer-headed shark, saw-fish, skate or ray, sea porcupine or square fish, fishing frog, common eel, serpent-hearted eel, and conger eel.

Still no pretensions are made in this work to completeness. It is not a book composed in the luxury of literary leisure, but a collection of notes which I have been making during the twenty years of my residence in this country in the corners of my time that would otherwise have been wasted. Often to forget my weariness when travelling, when it has been necessary to bivouac in the jungles while the Karens have been seeking fuel for their night fires, I have occupied myself with analyzing the flowers that were blooming around my couch, or examining the fish that were caught, or an occasional reptile, insect, or bird, that attracted my attention. With such occupations I have brightened many a solitary hour, and often has the most unpromising situation proved most fruitful in interest; for the barren heath with its mosses, lichens and insects, its stunted shrubs and pale flowers, becomes a paradise under the eye of observation, and to the genuine thinker the sandy beach and the arid wilds are full of wonders.

Without books and without means to convey away specimens, my plan was to note down just such characteristics in the objects that I observed as secured most of my attention; but when I came to compare my notes with descriptions in books, they would often be found to contain insufficient data to determine the species, and sometimes even the genus, but perhaps enough for the tribes or families. In Botany this was sometimes necessarily the case, because I frequently met with a plant in flower without the fruit, or in fruit without the flower, where both flower and fruit were necessary to determine the genus. Often, again, never contemplating publication, when I had no use for the article in translation, and no object in being precise, I was content, as with fish for instance, to satisfy myself that it was a cat fish, a member of the carp family, or an eel, as the case might be, without making observations which would enable me to distinguish the species.

Further investigation will supply many deficiencies and correct many errors that are inseparable from a first attempt like the present, which involves the observation of so many objects in so many different departments of natural science and their names in so many languages. Still it is confidently believed that no one can longer say of Farther India, as does Murray in his



Encyclopædia of Geography: "There are no materials on which we can attempt a botanical or geological delineation of this territory. The zoology also of these immense and luxuriant regions is scarcely known."

It will therefore be seen that a work like this was demanded, and I trust it will commend itself not only to the Biblical student, but to authors in the vernacular languages, especially to such as shall hereafter prepare native works on natural history. It will also be serviceable to those who translate from the Burmese or Karen into English, and to all natives who read English, and particularly to every one who desires to write on these provinces, either in India, England, or America.

This is my reply to those machines for eating and drinking, digging and working, hoarding and spending, who ask "WHAT'S THE USE OF IT?" They cannot well see the use of studying the stars, observing the stratification of rocks, or being curious about shells, minerals, and plants, birds, beasts, and insects.

TAVOY, 1852.



*(Title and Preface to the Second Edition.)*

BURMAH,  
ITS  
PEOPLE AND NATURAL PRODUCTIONS;  
OR  
NOTES  
ON THE  
NATIONS, FAUNA, FLORA AND MINERALS  
OF  
TENASSERIM, PEGU AND BURMAH.  
WITH  
SYSTEMATIC CATALOGUES  
OF THE KNOWN  
MAMMALS, BIRDS, FISH, REPTILES, MOLLUSKS, CRUSTACEANS, ANNELIDS,  
RADIATES, PLANTS AND MINERALS.  
WITH  
VERNACULAR NAMES.

BY  
REV. F. MASON, D.D., M.R.A.S.,  
CORRESPONDING MEMBER OF THE AMERICAN ORIENTAL SOCIETY, OF THE BOSTON SOCIETY OF  
NATURAL HISTORY, AND OF THE LYCEUM OF NATURAL HISTORY, NEW YORK.

*Celebrant te Domine omnia tua opera, tui te pii collaudant.*

RANGOON:  
THOS. STOWE RANNEY.  
1860.

LONDON:  
TRÜBNER & CO., 12, PATERNOSTER ROW.  
NEW YORK:  
PHINNEY, BLAKEMAN & MASON, No. 61, WALKER STREET.



(Dedication to the Second Edition.)

TO

LIEUT.-COL. ARTHUR P. PHAYRE,

COMMISSIONER OF PEGU.

THIS BOOK OF PEGU AND BURMAH,

WHICH IS MUCH INDEBTED TO HIS RESEARCHES,

IS RESPECTFULLY INSCRIBED

BY THE AUTHOR.

The golden age when Pegu was *savanna-humme* "The land of gold," and the Irrawaddy *savanna-nadde* "The river of gold," has passed away, and the country degenerated into the land of paddy, and the stream into the river of teak. Yet its last days are its best days. If the gold has vanished, so has oppression;—if the gems have fled, so have the task-masters;—if the palace of the "Brama of Toungoo" is in ruins who had "twenty-six crowned heads at his command," the slave is free.

Though a poor man cannot find sudden wealth as he may perchance in Australia or California, he can ever find work, and by two days' labour he can always earn enough to maintain himself the whole week; so by one year's toil he may gain sufficient to support himself three.

There is perhaps no country in the world where there are so few beggars, so little suffering, and so much actual independence in the lower strata of society as in Pegu. And perhaps in no part of India is the fire of truth upheaving those strata to the light, and metamorphosing them mentally, morally and socially, more surely or more rapidly than in Pegu.

Tutus bos etenim rura perambulat,  
Nutrit rura Ceres, almaque Faustitas,  
Pacatum volitant per mare navitae,  
Culpari metuit Fides;

Nullis polluitur casta domns stupris,  
Mos et lex maculosum edomuit nefas,  
Laudantur simili prole puerperae,  
Culpam poena premit comes.

Longas o utinam, dux bone, ferias  
Praestes Burmahiae! dicimus integro  
Sicci mane die, dicimus uvidi,  
Quum Sol Oceano subest.



# PREFACE

(TO THE SECOND EDITION).

---

SINCE the first edition of this work was printed, the annexation of Pegu has widened the field of observation, and the influx of European residents has multiplied observers. The results have been commensurate with the favourable circumstances, and our knowledge of the country, its nations, fauna, and flora, has greatly increased.

We are now well acquainted with several wild tribes, that seven years ago were scarcely known by name. When Capt. Yule wrote in 1857, he had heard of no Karens “farther north in Burmah than the district of Tsalen.” We now trace them above Ava, and Banno is of common occurrence in Bghai poetry as the name of a large Burmese city to which the people formerly went to make purchases, as they now do to Toungoo. His stock of Red Karen vocables, which consisted of a single word, has been multiplied a thousand-fold, and a book in the language is nearly ready for the press. Still the want of some “really good account of these tribes” remains in all its force, and is felt by none more deeply than by the writer. All our knowledge of them is fragmentary and unsatisfactory. The knowledge desired has not yet come up from the abyss of darkness. It is easier to ask a native a thousand archæological questions than for him to answer one correctly. Still the fragments are constantly increasing, and time is a great revealer of secrets.

Materials for this edition have been gleaned from every available source, both from printed papers and private correspondence, and our advance upon the first, which was very favourably received, may be seen in every branch. Col. Phayre has added the Jackal; Major Berdmore the Mole; Major Sparks the Rorqual; and Rev. Mr. Benjamin the Dugong or sea cow, to our Mammalia. From Mr. Blyth's reports, the birds have been increased from two hundred species to nearly five hundred. Major Berdmore, who was distinguished in nearly every branch of zoology, was especially successful in his researches among the fish and reptiles, and has contributed many new species. Capt. Smyth has furnished three hundred beetles, and Mr. Theobald a large number of shells. In botany the book is indebted for nearly all it contains on the Ferns and Mosses to Rev. C. P. Parish, who has also largely increased the number of flowering plants: while in Glossology the three Karen vocabularies have been increased to nine, pertaining to as many distinct tribes. Many good ideas have been appropriated from Capt. Yule's book, which is a fountain of facts on the history,

geography, and ethnology of Burmah. Extracts are given from Col. Phayre's reports indicative of a new government policy. From the patronage afforded the Karens, Government seems disposed now to foster the upward tendencies of the wild tribes in India, more than heretofore. In a political point of view the Christianization and civilization of these tribes is a matter of much more importance than is usually given it. Recent events have proved that one hundred years of British supremacy in India have not attached the Brahmin and Musselman to their English rulers any nearer than they were at the close of the battle of Plassy. It is equally apparent that where the Government acts in harmony with the Missionary, a Christian and civilized community is formed on the mountains, which is bound to the Government by a common religion and a common civilization. Though it may be comparatively small, it may be made, by a wise government, much more powerful than would be supposed by merely counting the heads. For instance, here is a Karen who keeps in his nest a Sharp's rifle, and knowing that he can use it twenty-five times without priming again, and can load it at the breech with great rapidity without any extraordinary amount of courage, he has confidence in his arms, and feels himself a match for a dozen ordinary equipped natives. Thus a small population, able to avail itself of the science of the nineteenth century, is of far more political importance than a tenfold larger one at the same point of civilization they were in when the Greeks ruled Asia. A force might be organized in the mountains that the Buddhist inhabitants of the plains in the event of war would dread; but to be efficient it must not be organized after the manner of ordinary corps. To bring the Karens to fight under their own chiefs must be the object, and this with judicious management can be done; but to induce them all to obey cordially a single head is a work of no easy accomplishment, owing to the clannish spirit which exists so strongly among them. The Maunepghas are jealous of the Pakus. The Pakus would not obey a Maunepgha Colonel, and neither would follow a Bghai leader. The same difficulties exist with the Mophas, Manumanaus, and Gay-khos, and until something common to all is found, they can never be brought to act together. Christianity, and Christianity alone, furnishes this point of union. Widely as these tribes have been separated in habits and feelings for untold ages, already the enquiry is, when they meet a stranger, not to what clan he belongs, but whether he is a *pyha-ba-yuwa-pho*, "a worshipper of Jehovah." Any attempt to bring Christians and heathen together will prove a failure. The banner of the corps must be the Cross, and their motto the same that led Constantine to victory,

IN HOC SIGNO VINCES.

TOUNGGOO, 1860.



## ERRATA.

For trivial errata the reader's indulgence is solicited, especially as regards the barbarous and unfamiliar names of many insects. The more important are given below.

- |      |     |      |      |        |                                     |                                    |  |
|------|-----|------|------|--------|-------------------------------------|------------------------------------|--|
| Page | 19, | line | 23,  | for    | STELLARIDLE                         | read                               | STELLARIDEA.   |
| „    | 59  | „    | 16,  | erase  | BIRHIA                              | EXCLUSA                            | and synonyms.  |
| „    | 61  | „    | 16,  | after  | Andamans                            | add                                | Tonasserim.  |
| „    | 105 | „    | 7,   | for    | Papilis                             | read                               | Papilio.   |
| „    | 130 | „    | 10,  | for    | Enelephas                           | read                               | Euclephas.   |
| „    | 130 | „    | 11,  | for    | Enelephas                           | Hyrndricus                         | read Enelephas Hysudricus.   |
| „    | 154 | „    | 3    | from   | bottom,                             | for                                | Pagidula read Pagodula.  |
| „    | 191 | „    | 7    | from   | bottom,                             | for                                | S read L.  |
| „    | 198 | „    | 25   | from   | bottom,                             | for                                | Nyā read Ngā.  |
| „    | 236 | „    | 3,   | for    | ZIBRINUS                            | read                               | ZIBRINUS.  |
| „    | 237 | „    | last | line,  | for                                 | marchos                            | read marchos.  |
| „    | 285 | „    |      |        | for                                 | SCYLLIDE                           | read SCYLLIDE.   |
| „    | 356 | „    | 28,  | for    | H.                                  | read                               | HIREUDO.   |
| „    | 377 | „    | 20,  | remove | A. CORAGINE                         | to                                 | below A. INDICA.   |
| „    | 361 | „    | 42,  | remove | ARACHNOTHERA ASIATICA               | and the three species which follow |  |
|      |     |      |      |        | to                                  | below                              | A. CHRYSOGENYS.  |
| „    | 404 |      |      | erase  | lines 18 to 21                      | from the bottom,                   | transposing lines 19-20 from   |
|      |     |      |      |        | the bottom                          | to page 405                        | after S. MINIMUS.  |
| „    | 466 | „    | 6,   | for    | P.M. $\frac{5}{4}$ M. $\frac{5}{4}$ | read                               | P.M. $\frac{8}{4}$ M. $\frac{4}{4}$ .  |
| „    | 466 | „    | 22,  | for    | P.M. $\frac{5}{4}$ M. $\frac{5}{4}$ | read                               | P.M. $\frac{8}{4}$ M. $\frac{4}{4}$ .  |
| „    | 467 | „    | 14,  | for    | P.M. $\frac{5}{4}$                  | read                               | P.M. $\frac{8}{4}$ .   |
| „    | 468 |      |      | after  | line 14,                            | add                                | Dentition, 1. $\frac{2}{4}$ ; C. $\frac{2}{4}$ ; P.M. $\frac{5}{4}$ ; M. $\frac{4}{4}$ . |
| „    | 469 |      |      | 8      | lines                               | from bottom,                       | for P.M. $\frac{5}{4}$ M. $\frac{5}{4}$ read P.M. $\frac{8}{4}$ M. $\frac{4}{4}$ .       |
| „    | 478 |      |      | line   | 20,                                 | for                                | pretiosio read pretioso.   |

To Index add:

consocia, 66	Page	529
coptobasis, 56		529
funebriis, 88		534



# BURMA, ITS PEOPLE AND PRODUCTIONS.

## GEOLOGY AND MINERALOGY.

THE chapters devoted in previous editions of this work to Geology and Mineralogy it has been deemed advisable completely to recast, as much of the information has been altogether superseded by later investigations.<sup>1</sup> In the earlier editions Dr. Mason thus quaintly prefaces the subject: "Burma is a gigantic geological museum full of magnificent specimens. All the principal formations in books, and gathered and labelled in glass cases, are spread over the land in immense masses, waiting for students to knock off specimens for themselves, and labelled by God himself in characters known and read of all men that interest themselves therewith. There are plutonic rocks and volcanic rocks, and fossiliferous rocks; Primitive, Transition, Secondary, Tertiary and Diluvial, Eocene, Miocene, and perhaps Pliocene. All that is wanting is a Curator to point out the places in the Museum where they are laid away. And here we are."

Burma is traversed in a general north and south direction by three main ranges of hills. Of these the most westerly is the Arakan range, which may be held to originate in the somewhat complicated ranges east of Chittagong and to stretch thence south, with a general parallelism with the coast, to Cape Negrais, where it terminates. The next range to the eastward is the Pegu range, commencing above the frontier, and running south as far as Rangoon, which may be regarded as its farthest point in that direction. This range, which is not more than half the height of the hill-ranges to the east, rarely rising above 2000 feet, forms the water-parting between the Irrawaddy and the Tsittoung rivers. The hills east of the Tsittoung may all be classed with the system of ranges which runs through the Tenasserim provinces and then narrowing, is continued south and forms the backbone of the Malayan Peninsula. These ranges are in places far loftier than those to the westward, attaining to 7000 feet and upwards.

### METAMORPHIC ROCKS.

These rocks consist in Burma of granitoid gneiss, hornblendic gneiss, crystalline limestone, quartzite, and schists of various kinds. They mainly occupy

<sup>1</sup> For a fuller account of the Geology of Burma reference may be made to chapter xxix. of the "Geology of India" by Messrs. Medlicott and Blanford, and to the interesting sketch of the physical features of the Islands in the Bay of Bengal in "Stray Feathers," vol. ii. p. 29.

a belt of country to the eastward of the newer formations, corresponding with the main ranges east of the Tsittoung. Between the Tsittoung and the Salween the gneiss passes into a true granite, which weathers down into remarkable rounded masses, which have been well described by the Rev. C. Parish, in his notes of a trip up the Salween (J.A.S.B. 1865, part ii. p. 135). Hornblende gneiss is subordinately associated with the above rock, and crystalline limestone is also not uncommon. No crystalline rocks (connected with the present group) occur in Pegu or Arakan west of the ranges separating the Tsittoung and Salween Rivers.

#### THE MERGUI GROUP.

Resting on the metamorphic rocks, and next in order of age, we find in the southern portion of the Tenasserim Provinces, a great accumulation of pseudo-porphyrific beds, of sedimentary origin, the characteristic feature of which is derived from the presence therein of imbedded fragments of felspar. From having as yet only been detected in the neighbourhood of Mergui, they have been termed the Mergui group. The rock in its normal form is earthy, but highly indurated; it passes on the one hand into a slate, without the conspicuously porphyritic aspect produced by the imbedded fragments of felspar, and on the other into grits and conglomerates. With these grits, and resting upon them, are dark-coloured earthy beds, finely laminated, associated with hard quartzose grits. The thickness of this group may be placed between 9,000 and 12,000 feet. No fossils have been hitherto detected in it, and its age is uncertain, possibly Silurian.

#### MAULMAIN GROUP.

The beds of the last group in the Tenasserim valley are succeeded, in ascending order, by hard sandstones in either thin or massive beds, with thin earthy partings, often finely laminated. The prevailing colour is reddish, and some of the beds are calcareous. Over these sandstones occur grey shaly beds, also sometimes calcareous, with occasional beds of dark sandstone, succeeded by soft sandstones, thickly bedded with grey and pinkish shaly layers intercalated, and upon these a thick series of beds of massive limestone. The whole group is between 6,000 and 7,000 feet thick or more, and contains fossils throughout, though usually in too poor a state for precise determination. *Spirifer* and *Productus* are the prevailing fossils, and the group is of distinctly Carboniferous age. The upper limestone is more than 1000 feet thick. It forms the conspicuous mutually-scarped hills near Maulmain, and ranges up the Salween valley into the Karen-ni country (of the "Red-Karens") beyond the British frontier; and the same formation not improbably forms part of the Mergui archipelago, many of the islands of which are known to consist of limestone, resembling that in the vicinity of Maulmain.

#### THE TRIASSIC GROUP.

Next in point of age comes in, a small area of rocks in quite another part of Burma, rocks of the Triassic age being only known as constituting a triangular tongue in the Arakan range, running down from the frontier to a point about west by north from Prome. The beds of this age are perhaps between 5000 and 6000 feet in thickness, the most characteristic of them being some white-speckled grits, with intercalated shales and sandstones, which attain about 1300 feet in thickness, in the Mlwa River, thirty-five miles west of Thayet-myo. Towards the base is a calcareous conglomerate and a rubbly limestone containing a *Cardita* and a few Gasteropods, and probably at about the same horizon. At some few other spots occurs a blue limestone, which has yielded the only typical fossil of the group, *Halobia Lomelli*, a Triassic bivalve of very wide distribution.

## THE CRETACEOUS GROUP.

Beds of Cretaceous age are only certainly known on the west of the Arakan range, in the southern borders of Arakan, near Mali in Sandoway. The determination of the age of these beds, which have the appearance of being conformable to the last, rests on a single specimen of *Ammonites inflatus*, a characteristic 'Cenomanian' cephalopod, common in the 'Utatur' beds of Southern India. No other fossils were found, and the country is very wild, and has not yet been brought thoroughly under survey. There is, however, some probability that Cretaceous rocks may exist in Tenasserim. On the Lenya River, in the extreme south of the province, a bed of coal occurs of very laminated structure, and containing numerous small nodules of a resinous mineral like amber. This peculiar association of mineral resin is characteristic of the Cretaceous coals of Assam; and it is highly probable the Lenya coal is of the same age. From Cape Negrais northward stretches a considerable thickness of beds remarkable for the intense alteration they have locally undergone. Their precise relations with the Cretaceous strata to the north, or the Tertiary strata to the eastward, is not clear, and they may not improbably embrace beds of both Mesozoic and Tertiary age. They are frequently charged with silica, by infiltration, and in places display veins of fibrous white quartz, associated with soapstone, chiefly along the western side of the Arakan range, and nowhere can the intense alteration the rocks have locally undergone be studied better than between tide-marks on the coast, where the hardened rocks of this division stand out in the form of craggy ledges, boldly fretted by the action of the waves and spray.

## THE NUMMULITIC GROUP.

Rocks of Eocene age occur both east and west of the Arakan range. On the east, at the frontier of Pegu, they are seventeen miles broad, in an east and west direction; but this breadth soon diminishes, though the group continues throughout Pegu as far as Puriam Point, at the mouth of the Bassein River. No precise estimate of the thickness of this group can be made, but it not improbably reaches to 10,000 feet. The most conspicuous member of this group is a pale-coloured limestone, charged with Nummulites and other fossils. Many of the shales, too, are crammed with similar organisms; but well-preserved fossils are rare, and without exception confined to the limestone or calcareous shales. In Thoudoung ('limo hill'), near Thayet-myo, a bed of coal was formerly worked to a small extent, but its development was too capricious and irregular to prove of value. It is in this group, as will be explained further on, that the Burmese petroleum would seem to originate. Although the age of the Tenasserim coal is not known, it may not improbably be of early Tertiary age. Its quality is fine, the proportion of volatile matter being large, whilst the amount of ash is small. The beds containing this coal are nowhere of great thickness, probably less than 1000 feet, and are nowhere traceable over large areas, but form small basins along the Tenasserim valley, their inaccessible position being a great bar to the profitable extraction of the fuel they contain. At Thatay-khyoung, on the Great Tenasserim, a seam occurs seven feet in thickness, including small partings of sand and clay; whilst at Heinlap, six miles distant, the seam is over seventeen feet thick. At Kammapeying, three-quarters of a mile north of Heinlap, there is a seam eight feet thick, but which contains much iron pyrites. A seam on the Little Tenasserim is only three feet thick. The coal of the Lenya River has been alluded to as of probably Cretaceous age.

## THE SIWALIK GROUP.

Above the Nummulitic group in Pegu and Arakan occurs a vast series of sandstones and shales, the undoubted homologues of the Siwalik group of the sub-

Himalayan region, and representing the entire Middle and Upper Tertiary period (Miocene and Pliocene). The beds, however, differ from the corresponding deposits of Northern India, in being distinctly marine, with the sole exception of the uppermost beds of the series, which are probably of freshwater origin. A group of shales at their base, 800 feet or so thick, has been separated under the name 'Sitsyahn shales,' from a village on the right bank of the Irrawaddy above Prome, where they are well seen; and a great thickness of sandstones, often highly fossiliferous, which succeeds them, and cannot be far less than 3000 feet thick, has been named the Prome beds, from being largely developed near Prome; but the country occupied by these beds is not favourable for accurate estimates of thickness. Near Kāna, on the right bank of the Irrawaddy, a blue clay of this group is richly fossiliferous, being charged with Foraminifera and well-preserved though small shells. Many of these fossils fall to pieces on drying. The topmost beds of the group are sandstones abounding in parts in *Turritella*, corals of the genus *Cladocera*, and many other shells and radiates, together with sharks' teeth of two or three genera (*Lamna*, *Carcharodon*, etc.). These marine beds pass up into clays and sandstones in which no marine fossils have been detected, but wherein trunks of silicified trees abound; and as these are untouched by boring mollusca, it is presumed the water wherein they floated was fresh. The great bulk of this fossil wood is exogenous, and not coniferous; but in the gravels of the Irrawaddy rolled pieces of silicified endogenous wood occur, undoubtedly derived from the same beds. These silicified wood beds are the highest Tertiary beds exposed in Pegu, and are now much circumscribed in their area by denudation. They occur on the right bank of the Irrawaddy, near Thayet-myo; still more largely north of Prome, and along the Pegu range, till they are covered up to the south, and concealed by the gravel and surface detritus, to the formation of which they have so largely contributed. On the east of the Pegu range, in Toung-ngoo, they are also met with; and across the Tsittoung, to the eastward, they are represented by a lateritic belt, often conglomeratic, fringing the hills east of the river. The most characteristic fossils from these uppermost beds are *Stegodon Cleftii*, *Mastodon latidens*, *M. Siwalensis*, *Rhinoceros iravadiensis*, *Acrotherium perimense*, *Hexaprotodon iravadiensis*, *Merycopotamus dissilis*, *Vishnuthierium iravadicum*, *Colossochelys atlas*, besides other less characteristic forms, clearly demonstrating the relationship of these beds with the Upper Siwaliks of Northern India. These Tertiary beds have not been traced south of Pegu, but range in full force into Arakan, though their divisions have not yet been worked out.

#### RECENT DEPOSITS.

Alluvial deposits are roughly divisible into an older alluvium called *Bhangar* in India, and a newer alluvium termed *Khadir*. The present river-valleys are usually carved out of the former by wandering river action, whilst the *Khadir* is the deposit of flood-waters, in the broad valleys excavated in the older deposit. In Burma however, along the great river-valleys, as the Irrawaddy, Tsittoung, etc., the alluvium of the country belongs to the former class, no large areas being occupied by the newer deposits, which are restricted within the narrowest limits to the immediate channel of the river. In this respect a striking contrast exists between the delta of the Irrawaddy and that of the Ganges, the richest land of Lower Bengal being composed of *Khadir* land, which is almost wanting in Pegu. This difference in geological structure is an index of the different conditions of the two areas. Lower Bengal, being an area of subsidence, permits the accumulation *pari passu* of Gangetic silt, whereby the balance of level is maintained, whereas in Pegu, which is either stationary or rising, the deposits of the Irrawaddy in flood are swept out to sea, and no deposit of *Khadir* accordingly takes place save in actual proximity to the river-banks. Another cause operates to limit and reduce to a minimum the deposition of silt from the Irrawaddy in Pegu. The rains falling early, the flood-waters, depurated of their coarser particles, as they

leave the hills, spread in sheets over the plains, forming huge inland lakes, so that on the turbid waters of the river rising, they are prevented from spreading far from the banks, in spite of the flatness and low nature of the ground, by these depressions in the surface of the country being already occupied by water from the hills, which by the end of the rainy season has acquired a clear brownish colour, from decomposed vegetable matter in solution, but which deposits next to nothing on the area covered by it, and from which all intrusion of turbid river-water is effectually barred.

### INTRUSIVE ROCKS.

Under this head are included all rocks of a plutonic or volcanic character, granite, trap, basalt, lava, serpentine, etc. Some rocks related to this class as 'ash-beds,' though the product of volcanic agency, are spread out contemporaneously with the beds wherein they occur by the action of the waters beneath which they were erupted. Beds of this class (ash-beds) are frequently not easy to distinguish from ordinary sedimentary deposits, and are rare in Burma, but a small patch occurs in Prome district at Minet-toung or the 'black hill,' so called from the colour of the surface soil, which precisely resembles the *regur*, or black cotton soil of India. There are three spots where this rock occurs; at two 'Minet-toungs' the ash-bed, a contemporary trap as it is in part, forms the top of the hill; whereas in the third, the dark line marks the outcrop of the same bed inclined at a considerable angle and clearly intercalated in the Tertiary series.

GRANITE.—This rock does not occur west of the Tsittoung, but east of that river it is largely developed, and gives rise to very picturesque scenery. It stretches away north beyond the British boundary up the Salween valley, and down south through the Tenasserim Provinces into Siamese territory. This great belt of granite is remarkable as the rock wherein the tin-stone is imbedded, which forms one of the most valuable mineral products of the country. There are no workings of this ore in Martaban, though just across the border it is worked by the Karens, and the metal run into the form of small pigs of about a 'viss' in weight each; but there seems reason to believe that the ore occurs within the British territory also, though in a wild and thinly-inhabited country. The ore is also known in Tenasserim on the streams falling into the Henzai basin, and will probably one day be worked with profit when the country becomes more accessible and populous.

TRAP, BASALT, GREENSTONE.—These rocks may be said to be unknown west of the Tsittoung, but dykes of them traverse the metamorphic rocks east of that river, and in Tenasserim; they are not, however, largely developed, and call for no special notice.

SERPENTINE.—This rock is met with in Pegu at various spots in the Arakan range, mainly on the east side, that is, within the Irrawaddy valley. These outbursts form three principal groups; the hills composed of this rock being remarkable for their sterile aspect. The most northerly mass constitutes a horse-shoe-shaped intrusion forming Bidoung hill nearly due west of Thayet-myo. Several masses also occur north-north-west of Prome, one of which forms a long dyke-like mass running for about five miles along the boundary of the Nummulitic and Triassic rocks, with the appearance of altering the latter, but not the former, though they are much crushed, indicating therefore that the newer rocks are brought in contact with the serpentine by a fault. Another group of upwards of twenty-one isolated serpentine intrusions occurs west of Henzada, scattered over a length of twenty-six miles in a north and south direction. The largest outburst is three miles in length, but the majority are less than a mile in diameter. Associated with the serpentine, and as though the result of its action on the neighbouring rocks, occurs a great deal of the soapstone (*kāngu*) used by the Burmese for writing. The mineral is identical with that imported from Upper Burma, and occurs in veins associated with fibrous quartz, the two being much interlaced. In some

places to the south, on the western side of the Arakan range, the same veins of fibrous quartz and soapstone occur, where no serpentine is known; but the rock may exist undetected, as the spots are in dense jungle, where any close examination of the ground is difficult, and the same mineral also occurs near Sandoway. The serpentine in Pegu is a characteristic dark-coloured rock, passing into a gabbro, and containing bronzite as an adventitious mineral, and thin veins or partings of golden chrysolite and carbonate of magnesia. The rock is unfortunately so much traversed by cracks or divisional planes as to be unfitted for ornamental purposes. Serpentine also occurs in the Andaman and Nicobar Islands, of probably the same age, and in a similar manner as in the Arakan range.

Trachyte.—The only known locality for trachyte in British Burma is four miles east by north of the village of Byān-gyee, on the Bassein River, fourteen miles south of Nga-pu-taw, and thirty miles south of Bassein. Here a mass of trachyte occurs six feet in diameter, surrounded by Nummulitic strata. It is known in the neighbourhood by the name 'Kyouk ta lon,' and is probably the projecting end of a 'pipe-vein' of the rock marking the point of issue of an old volcanic vent. It is only fifteen miles east of a straight line drawn from Barren Island, an active volcano in the Bay of Bengal, to Puppadoung, an extinct volcano in Upper Burma.

#### VOLCANOES AND MUD VOLCANOES.

The only volcanic islands, or volcanic cones as they really are, in the vicinity of Burma, are Barren Island and Narkondam Island, the former of which has displayed signs of activity in modern times, whilst Narkondam is densely wooded and appears extinct. These two islands are the termination in the Bay of Bengal of the line of volcanic vents of Java and the Malayan peninsula; but a further extension of the same line or volcanic belt is indicated by the extinct volcano of Puppadoung in Upper Burma.

The so called 'mud volcanoes' of Arakan and Burma belong to a totally different class, having no connexion with volcanic agency properly so called. The eruptions to which they are subject are due to the escape and ignition of volumes of 'marsh gas' which issues in a vast number of places in Burma along the Arakan range, together with petroleum and feebly saline springs. Mud and water are freely ejected by these 'volcanoes,' and lumps of stone and shale occasionally more or less acted on by the flames, but no scorice, lava, or other products of volcanic action proper. The principal vents are at Memboon, on the Irrawaddy, and in the islands of Ramri and Cheduba on the Arakan coast, with a few scattered vents on the neighbouring islands. The ignition of the gas is ascribed by Mr. Mallet to frictional electricity, and not to the high temperature of the substances ejected, which as a rule are unaltered by heat, partially calcined lumps being rare and exceptional.

In some parts of Prome, where springs issue in an alluvial tract or among argillaceous beds, a pool is formed of deep mud, into which any animal falling is in the utmost danger of being engulfed. These mud holes are especially dangerous in dry weather, when they become caked over, with a treacherous crust, with a soft patch of a few feet in diameter in the centre, but which suddenly yields beneath any heavy animal venturing on, and engulphs it in the semifluid paste beneath.

The known connexion of petroleum and brine springs in America suggests a few words on their relations in Burma. In Burma the only known localities for petroleum lie within the area of unaltered Nummulitic strata, or of rocks of younger age superimposed thereon. Brine springs, on the contrary, though rising through these younger rocks, are more plentiful in an area composed of altered rock of presumably older character; hence, although in America brine springs may indicate the probability of also meeting with petroleum, yet in Burma a copious brine spring



would probably signify that the boring had reached a horizon lower than that of the naphthagenous beds of the district. As the naphthagenous beds (as assumed) are on a higher horizon than the beds whence the brine springs originally issue, petroleum may of course be associated with them, and brought up along with them to the surface, *within the area* occupied by the newer naphthagenous beds; but the reverse does not hold good, and there is no ground for expecting to meet with petroleum everywhere, in connexion with brine springs, when such rise, or are 'tapped' outside of the area of the naphthagenous rocks. In a word, in America, petroleum is produced in rocks of very different ages, mainly Palaeozoic, whereas in Pegu it seems confined to rocks of Tertiary age alone, though the brine springs have a deeper origin, and are merely fortuitously associated with petroleum at their point of issue at the surface, when such point happens to fall within the area of the naphthagenous strata.

The Tenasserim Provinces, writes Dr. Mason, "are well supplied with hot springs, and some of them are probably not inferior in their medicinal qualities to the fashionable Spas of Europe and America." The hot springs of the Attaran are situated within two miles of the old town of Attaran, and are thus described by Dr. Helfer, "There are ten hot springs, or rather hot-water ponds, of which I could only examine the nearest, as the access to the others was through deep water of 130° Fahrenheit. This was a semicircular pond of about fifty feet in circumference. In one place it was thirty-five feet deep. The quantity of carbonic acid which the springs evolve seems to render the neighbourhood peculiarly adapted to support vegetable life. The ground round the spring is strongly impregnated with iron, and the water which runs over the ochre mud has a strong styptic taste. The springs on the Attaran approach in their composition nearest to the celebrated water of Toplitz."

Dr. Mason also records hot springs "about four miles below Mattah at the forks of the Tenasserim, and a few miles north of the latitude of Tavoy, highly charged with sulphuretted hydrogen gas, so readily recognized by its smell, which is precisely that of the washings of a gun barrel, the odour in both instances being produced by the same gas. Dr. Helfer says these springs belonged to the class of sulphurous mineral waters tinged slightly with chalybeate like the water of Brighton. Mr. Bennett at a recent visit found the thermometer to rise in the hottest spring to only 119°." Dr. Mason thus describes the Pai springs:—

"On the margin of the granite range east of Tavoy, either near the junction of the slate and granite, or in the granite itself, is a series of the hottest springs in the Provinces. I have visited four or five in a line of fifty or sixty miles, and found them uniformly of a saline character. Around one nearly east of Tavoy, the stones are covered with an efflorescence resembling epsom or glauber salt. Mr. Bennett found the thermometer in this spring to rise to 144°. Major McLeod visited one of the series at Palouk, and writes: 'There are two spots where the springs show themselves. One immediately in the right bank of the river, and another two or three minutes walk to the north-east inland. There must be 30 or 40 bubbling up along a line of about 50 feet by 20. The hottest was 196°, another 194°. No disagreeable smell or taste.'

"The hottest springs are at Pai, ten or fifteen miles north of those visited by Major McLeod. The principal spring at Pai,—for there are several,—is in a little sandy basin in the midst of granite rocks on the margin of a cold-water stream, where it bubbles up from three or four vents, and on immersing the thermometer into one, the mercury rises to 198°, within fourteen degrees of boiling water. Its location is rather peculiar, not being in a valley like the others I have seen, but on the side of a hill more than a thousand feet above the level of the sea, and surrounded by large masses of coarse-grained granite rocks, which seem to have been detached from the summit above."

Another observer, Capt. J. F. Stevenson, gives an account of other springs at the same place (J. A. S. B. 1863, p. 383):—"The Pai River is about sixty-five miles south from Tavoy town, near the Mergui boundary. It rises in the range of hills

which intersects this district between the Tenasserim and the Tavoy river-valleys, and after a generally direct east and west course, falls into the sea about six miles below the village of *Kyaukhtsay*."

"We found the springs in a narrow granite rock channel, through which a shallow stream falls in little cascades, divided by small pools. The most striking feature of the scene was the jet of steam which seemed to give off the greater portion of the clouds of steam overhead. It rushes out of a hole nearly midway down a cascade some six feet high, with a noise precisely like that of a steam jet, and with such force that it drives the water of the cascade horizontally out some four or five feet. The water which issues from this hole with the steam, or at least comes into contact with the steam, was hot enough to boil an egg well enough to eat, in three minutes."

Mr. Tween examined the water from Pai, and found it to contain—"iron, alumina, lime, potash, soda, silica, hydrochloric acid, sulphuric acid, hydrosulphuric acid, and organic matter which is nitrogenous."

In Martaban, hot springs are frequent, rising in the valleys which intersect the ranges east of the Tsittoung. Dr. Mason records a hot spring "at Toung-ngoo some twenty miles east of the city, in the granite mountains, two or three thousand feet above the plains; but the heat is not equal to those in the Tenasserim Provinces."

There are also hot springs in the Lepan-bew-choung, in lat.  $19^{\circ} 16' 30''$ , long.  $96^{\circ} 36'$ ; another in the Choung-mah-nay valley, lat.  $18^{\circ} 44'$ , long.  $96^{\circ} 46'$ ; and a hot spring of  $157^{\circ}$  Fahr. in the Hlay-loo-myoung-choung, lat.  $18^{\circ} 33'$ , long.  $96^{\circ} 54'$ . These are but a few of the springs which rise along this range of mountains and few of which have ever been visited by a European.

The only hot spring known in Pegu rises in the bed of the Bulay stream, under the village of Kwon-bulay, lat.  $19^{\circ} 15'$ , long.  $96^{\circ} 16'$ ; but the temperature could not be taken, as at the time of my visit it was concealed by a sand bank which had been washed over it.

Mr. Bunbury also discovered a hot spring near the sources of the Sandoway River in lat.  $18^{\circ} 6' 20''$ , long.  $94^{\circ} 54'$ .

The list of minerals in the present edition is very much smaller than in previous ones, as a great number have been omitted; for example, all imported factitious minerals, as sulphate of copper, oxide of arsenic and its sulphides, vermilion, etc.; also minerals which have been included without any grounds, as borax, mercury, diamonds, etc.; and lastly minerals properly classed with rocks, as limestone, slate, clays, etc. The classification adopted is that of Dana.

## Group I. NATIVE ELEMENTS.

### GOLD—'*Shwac*.'

"Though not quite so abundant (writes Dr. Mason) as in California, there is perhaps no mineral except iron more universally diffused over Burma than gold. It is found near the old town of Tenasserim, where I have seen Burmans employed in washing the sands of the river. Almost all the creeks (writes Dr. Helfer) coming from the eastern or Siamese side of the Tenasserim river contain gold. Tavoy river at its sources is rich in gold, and on the Siamese side of the water-shed, several hundred persons are reported as permanently employed at the diggings. It has been collected in the tin deposits east of Tavoy and on the sea-side of the granite mountains south of Ye. Pegu was formerly so rich in gold that it obtained the name *Suwanathumi* 'the land of gold,' and the Irrawaddy was called *Suwanmadi* 'the river of gold,' while 'Thatung,' confessedly the oldest city on the coast, is derived, according to Lieut. A. St. John, from *Thoon-letung-downg*, literally 'Silver-gold-city.' In modern times *Shwagau* up the Tsittoung signifies 'gold sifting.'

Mr. Fedden saw people washing the sands of the Salween for gold above the Ta-can ferry, and heard that it was found near Bauzee, in the Myet-gwe valley, and Dr. Oldham wrote that in many of the streams in the upper part of the Irrawaddy gold is washed." The following is a list of the principal gold localities worked in Burma according to Dr. Mason :—

Near the town of Tenasserim.	Salween, above Ta-can ferry.
Eastern tributaries of the Tenasserim.	Near Bauzee, valley of Myet-gwe.
Western tributaries, with Tin.	Kiblung on the Irrawaddy, and its tributary streams.
Upper part of the Tavoy river.	Near Thingadham.
Henzai river.	Kyen-dwen.
Shwegyen.	Near Blamo.
Hoyan, near the Salween.	

Of the Shwegyen gold forwarded to Calcutta by Major Berdmore, Dr. Oldham wrote, "The specimens of gold forwarded consist of varieties ranging from dust of the finest kind that could be mechanically separated, to small 'nuggets.' These (nuggets) very well illustrate the mode of occurrence of the gold in its native state imbedded in quartz, while the other specimens show that the general form in which it is found in these washings is in small rounded flakes, or flattened plates of various sizes. This gold is of considerable purity, one specimen was examined with some care, and yielded in 100 parts 92 of gold and 8 of silver. This is sufficient to show that the Shwegyeng gold is fully equal in value to the average quality of Australian gold."

Mr. O'Riley also declares that a sample of Tavoy gold examined in Calcutta by the Assay Master of the Mint, yielded 88 parts nearly of gold, and 9 of silver, so that Burmese gold would seem to be alloyed with 8 or 9 per cent. of silver.

#### PLATINUM.

Platina (writes Dr. Mason) is found in the neighbourhood of Ava, but we know nothing of it beyond what Col. Burney wrote a quarter of a century ago. The locality given by Burney is the Kyendween River, and its western tributaries near the town of 'Kannee.' The Burmese call platina 'Sheen than,' and according to Burney it is associated with gold, in the small tributaries of the Irrawaddy in the direction of Blamo. In confirmation of the occurrence of the metal in Burma, Mr. Johnstone, writing to Dr. Mason in April, 1872, says, "I have also heard something of platina, it is found at the place you mention, also at the River Moo, and at a place on the Upper Irrawaddy, nearly opposite Mogonng. It is found along with the gold by the gold washers, I cannot say in what quantity, as I don't think they look specially for it, neither do I find that they make any use of it." It does not, however, appear that any specimens of platinum have ever been received, and its actual existence therefore rests on a single analysis of a platina 'button' from Ava, which is certainly remarkable, given by J. Prinsep, in vol. iii. *Gleanings of Science*, which is as follows :—

Platina .....	35
Gold .....	5
Iridium } .....	40
Osmium } .....	
Arsenic } .....	20
Lead } .....	
	<hr/>
	100

Specimens of the metallic substances associated with the gold of the Irrawaddy would be valuable contributions to the Museum in Calcutta, and give certainty to our present vague knowledge of the subject.

## IRIDOSMINE.

An alloy of the metals osmium and iridium, only known as occurring in Burma from the above analysis.

## SILVER.

Metallie silver is only known to occur in Burma as an alloy of gold, the gold dust of Tavoy containing about 9 per cent. of silver, and that of Shwegyen about 8, according to an analysis by Dr. Oldham.

## CARBON. GRAPHITE.

Col. Bogle forwarded specimens of graphite of fair quality from the Tenasserim Provinces, and Dr. Mason records having seen "fine specimens from the Kannee Valley, twenty miles north-east of Toung-ngoo, where the Karens report the substance abundant."

## Group II. SULPHIDES, ARSENIDES, ETC.

## STIBNITE. SULPHIDE OF ANTIMONY.

This metal seems not uncommon in some parts of Martaban and Amherst. "It is reported as being often met with in the mountains that bound the valley of the Thoungyeen. Mr. O'Riley found it at the sources of the Attaran, and large quantities of the ore have been dug up within seven or eight miles of Maulmain." This mineral is often confounded with the next, the term 'surma' being applied to both, and both being used in powder as a 'collyrium.'

## GALENA. SULPHIDE OF LEAD.

This ore of lead is common in Burma, and is invariably argentiferous. The mean of three samples from Martaban gave over six ounces of silver to the ton, another sample nineteen ounces, one from Tavoy sixteen ounces, one from Toung-ngoo twenty ounces, and the mean of three samples from Bhamo over seventy-eight ounces,—which shows the variability of the result from small specimens, and the necessity of taking a large number of samples for averaging the value of the ores of any locality it is proposed to work. The ore would seem generally to occur in limestone. It is not however much worked in Burma, most of the metal used in Upper Burma being brought from the Shan states.

## O'RILEYITE (Waldie, J.A.S.B. Proc. 1870, p. 279).

This mineral, which seems an arsenide of iron and copper, was obtained from some spot in the Yoonzalin River by Mr. O'Riley, and may be considered as an ore of arsenic containing some thirty-eight per cent. of that metal, and about the same amount of iron. It was also estimated to contain over thirty ounces of silver to the ton, but nothing is known of its mode of occurrence.

## PYRITE. BISULPHIDE OF IRON. IRON PYRITES. MARCASITE.

This universally distributed mineral is common in Burma, but is nowhere plentiful or put to any use. Some of the Tenasserim coals have it, whilst others are free from its objectionable presence.

## CHALCOPYRITE. SULPHIDE OF COPPER AND IRON. COPPER PYLITES.

This ore appears to have been obtained by Mr. O'Riley in the Attaran, and Major Bogle forwarded from the Tenasserim Provinces to Dr. Oldham, "a specimen of finely crystalline copper pyrites, imbedded in quartz, part of a vein which if of any size would be a valuable source of this ore. The ore is good, could be very easily dressed, and might yield even with inferior management twelve to fifteen per cent. of metal." The locality does not however, unfortunately, appear to be known.

## TETRAHEDRITE. SULPHANTIMONITE OF COPPER. GREY COPPER ORE.

According to Mr. O'Riley, this ore occurs on several islands of the Mergui Archipelago, and possibly in Martaban, but nothing certain is known regarding the localities it is found in. Bournonite, sulphantimonite of lead and copper has been obtained near Maulmain.

## Group III. CHLORINE COMPOUNDS, ETC.

## HALITE. SODIUM CHLORIDE. COMMON SALT.

Salt is manufactured on a small scale in Pegu from sea-water. The concentration is effected in thick earthen pots ranged in scores round a circular oven, pierced with rows of holes into which the pots fit, and are so subjected to the heat of a fire within. English salt and rock salt from India are also imported.

## Group IV. FLUORINE COMPOUNDS.

## FLUORITE. CALCIUM FLUORIDE. FLUOR OR DERBYSHIRE SPAR.

"I have a small specimen of bluish crystals of fluor-spar which the Burman who brought it said was found in the northern part of Province Amherst. As the mineral is often found in connexion with lead, it is probable they will be found together in these provinces." This discovery of Dr. Mason's is still uncorroborated.

## Group V. OXYGEN COMPOUNDS.

## A. BINARY COMPOUNDS.

## CORUNDUM. NATIVE ALUMINA.

Crystallized alumina, when transparent, constitutes according to its colour sapphire, oriental ruby, oriental topaz, or oriental emerald, etc. When opaque, or massive and granular, it is termed corundum (*karand*), and emery when the mass is partly composed of hematite and magnetite. Crystallized alumina is the hardest substance after the diamond.

"The red sapphire (writes Dr. Mason) is usually denominated the oriental ruby. Dana says, 'The best ruby sapphires occur in the Capelan Mountains near Syriam, a city of Pegu.' This is an advance on Phillips, who made 'Pegu a city in Ceylon.' Still the mineralogists make slow progress in Geography. In 1853, a letter from a Roman Catholic priest, D. Amata, was published in the Journal of the Asiatic Society of Bengal, which showed that the Capelan Mountains are about seventy miles north of Ava, instead of being in the vicinity of Rangoon, as they would be if 'near Syriam.'"

The Capelan Mountains of Dana are doubtless a corrupt form of *Kyat-pen*, the name of a village near the mines, and the mines themselves are simply pits sunk in the ruby-producing gravel. Mr. Emanuel in his work on precious stones remarks, "The most valuable tint is that particular shade called by jewellers the 'pigeon's blood,' which is of a pure deep rich red without any admixture of blue or yellow. The stones called spinel, and balas rubies are not rubies at all, but belong to the class of spinels, a stone of an entirely different nature and form of crystallization." Mr. Emanuel also gives the prices of rubies as follows, that is, for the finest and purest stones: 1 carat, £14 to £20; 2 carats, £70 to £80; 3 carats, £200 to £250; 4 carats, £100 to £450. But all depends on colour, and a ruby of 4 carats might, if it missed the true tint, be not worth £12.<sup>1</sup>

<sup>1</sup> 1 carat = 4 grains; 151½ carats = 1 oz. Troy.

## HEMATITE. SESQUIOXIDE OF IRON.

To this species belong specular iron, micaceous iron, fibrous hematite, etc. A deposit of specular iron ore occurs on one of the branches of the Palouk River. "The natives think it an ore of silver, and call it 'the silver stone.'"

The same ore occurs in many places east of the Tsittong River.

## MAGNETITE. PROTOSESQUIOXIDE OF IRON. NATIVE LOADSTONE.

A valuable ore, similar to the last, but containing a mixture of protoxide as well: hence its effect on the magnet. It sometimes possesses 'polarity' also, one end of a fragment attracting the north pole of a magnetic needle, whilst the other end repels it. A large deposit of this ore occurs some three miles north-west of Tavoy. Two specimens gave, on analysis by Dr. Ure, over 60 per cent. of metallic iron. Two other specimens were even richer, and none of them contained either manganese or titanium.

## LIMONITE. HYDROUS OXIDE OF IRON. CONCRETIONARY IRON ORE.

This is a valuable ore, but alloyed with clay usually. It is the ore which was formerly smelted in the Prome district, where it forms hollow concretions and nodular masses in some Tertiary sandstones in the district. Under this head may be classed the yellow ochraceous and bog iron ores. Mason says these ores are common in the provinces, but does not specify localities. These ores are not now smelted, as English iron is imported more cheaply.

## SPINEL. ALUMINATE OF MAGNESIUM.

The red transparent varieties constitute the 'spinel' or 'balas' ruby, which differs from the oriental or precious ruby in composition, hardness and form. The 'sapphire' or ruby crystallizing in hexagonal prisms, the 'spinel' in dodecahedrons, which are often 'twinned' or maced. It forms the bulk of the green sand brought down from Ava, and the residue is mainly composed of small sapphires. The component of a handful, Dr. Mason describes as comprising every shade, "black, blue, violet, scarlet, rose, orange, amber-yellow, wine-yellow, brown and white."

## CASSITERITE. BINOXIDE OF TIN. TINSTONE.

This mineral is abundant in Burma, and in association with the granite, previously described as forming a belt through the Tenasserim provinces, is found in a variety of spots from the Karen-ni country north-east of Toung-ngoo to the Pakehan River in Southern Tenasserim. The works at Malce-won, however, on the Pakehan River in north latitude  $10^{\circ} 10'$ , are the only ones which are regularly carried on in British territory. "The richest locality in the province of Tavoy is nearly opposite the city of Tavoy on the eastern side of the mountains. Capt. Tremenhoe found the richest deposit of tin in the province of Kahan on Mergui Island, about eleven miles above the town, and near the Tenasserim River. According to Capt. Tremenhoe, large scales of chlorite occur with it, and as they are generally found where the tin is most abundant, the natives call it 'the mother of tin' (query mica?). The face of the hill is in one spot covered over with these, which appear to have been brought down from the vein with other matter, from which the tin has been separated by the usual mode of washing. This vein is described as consisting of decomposed granite three feet wide, in white sandstone, and dipping with a high angle. No tin has been raised since the country came into our possession, but it was worked during the Burmese rule, and valued as supplying the richest ore of tin. At Kay-mah-lypyoo, east of Toung-ngoo, and on the eastern slopes of the Ponglong range, a few miles beyond the British boundary, tin is largely worked by the Karen-ni, or Red Karens, who cast the metal into small pigs of a 'viss' each, which circulate as rupees. According to Mr. O'Riley, the tin ore is not confined to the eastern slopes, but is found on the western side of the mountains, also in British

territory. The following is the list of stages between Toung-ngoo and Kay-mah-hpyoo :

Toung-ngoo to Khoung-monk-kwa. ... ..	miles 18
Khoung-monk-kwa to Paylawá. ... ..	" 8
Paylawá to Bo-galay ... ..	" 8
Bo-galay to Nathedo. ... ..	" 10
Nathedo to Mohwaydo. ... ..	" 10
Mohwaydo to Tombo. ... ..	" 6
Tombo to Kadowbo. ... ..	" 16
Kadowbo to Kay-mah-hpyoo. ... ..	" 15

The British boundary is crossed about the fourth mile on the last march.

#### PSILOMELANE. BLACK OXIDE OF MANGANESE. WAD.

This ore is of doubtful occurrence in Burma, though Dr. Mason says it occurs on some islands of the Mergui Archipelago. The bed of "Wad" reported by Capt. Tremenheere on the Tenasserim was found by Mr. Piddington to contain no trace of manganese, but to consist of a peculiar graphitous substance, between coal and graphite, which he named "Tremenheerite," but its claim to be regarded as a mineral species is very doubtful. The paragraph therefore recording the existence of manganese, at p. 64 of the British Burma Gazetteer, should be expunged.

#### QUARTZ. SILICA.

Besides the ordinary varieties of quartz, green and yellow quartz are stated by Dr. Mason to be found in the Tenasserim Provinces, and carnelian called by the Burmese *Kyat-thwe* 'fowl's blood.' As the red colour, however, is artificially induced by burning or baking, it may be questioned if the stone is found originally in the Province. The carnelian of commerce is derived from the trap rocks of Western India, and the carnelian mines at Rajpipla are simply gravel-pits. The rough carnelians are placed in earthen pots, and baked, and the "red" carnelians which result are then sold. Dr. Mason also records agates as found at Mopoon and Mergui, but their occurrence requires confirmation, also amethyst. "Pebbles of amethyst, or violet quartz, are brought from the mines in Burma, where they are regarded as a variety of the sapphire; the Burmese name signifying 'egg-plant sapphire,' or, as they are sometimes called, 'egg-plant flower stone,' from the blue flower of the egg-plant."

Agates may be divided into two classes, banded agates, to which class onyx and sardonyx may be referred, and "Moss" agates, which are sponges or other organisms preserved in flint, and are of course confined to sedimentary rocks. Moss stones are banded agates with the appearance of filaments of moss between the layers. These filaments are however inorganic, and merely dendritic crystals of iron and manganese. Some chalcedonies closely resemble true "moss" agates when clouded with red protoxide of iron or green earth. It is doubtful if either class of agates occur in Burma.

### B. TERNARY COMPOUNDS.

#### PYROXENE OR AUGITE.

A constituent of the volcanic rocks of Puppadoung, etc.

#### AMPHIBOLE OR HORNBLende.

A constituent of some metamorphic rocks of Burma. Under this head are included tremolite, actinolite, asbestos, and jade. This last is an important article of export from Upper Burma. Its colours (Burmese or precious jade) vary from pearly grey or whitish to light muddy or leek green or dark green. Rolled pebbles of this are exteriorly rusty-coloured. A highly-prized variety is a pale grey with

spots, clouds and veins, of a bright apple green. A block, considerably under a cubic yard, was some years since, in Rangoon, valued at £10,000, but found no buyers, though it is said £8,000 were offered by the Chinese for it.

#### GARNET.

A subordinate constituent of some metamorphic rocks.

#### BERYL. SILICATE OF ALUMINUM AND GLUCINUM.

Common beryls are the "aqua-marine" of jewellers. The emerald is a more valuable variety coloured by chrome. Both aqua-marines and emeralds are said to be brought from Upper Burma.

#### CHONDRODITE.

In granular limestone near Mandalay.

#### TOURMALINE.

Schorl, or black tourmaline, occurs not rarely in the metamorphic rocks east of the Tsittoung. Red tourmaline also occurs in Upper Burma, and Symes, the British Envoy to the King of Burma, was presented with a superb red tourmaline valued in England at £500.

#### GYPSUM. HYDROUS CALCIUM SULPHATE.

The only form of gypsum in Burma is in the shape of thin veins traversing some of the Tertiary clays of the province. When transparent, it is termed selenite.

#### CALCITE. CALCIUM CARBONATE. CALCAREOUS SPAR.

Crystalline carbonate of lime usually occurs as a vein traversing limestone or other rocks, or occupying cavities. It also occurs in the form of "stalactite," depending from limestone caves, being deposited gradually by the water trickling from the roofs. That which accumulates on the floor is termed "stalagmite." It is usually mixed with a proportion of iron and alumina, but when crystalline, forms a handsome and ornamental building stone (as in the grand mosque at Cairo), and is then termed oriental alabaster. It is abundant in the limestone caves of Burma. An impure earthy form occurs in travertin or calcareous tuffa, deposited on the surface of rocks by running water, and which is a valuable source of lime when, as is usually the case, it is plentifully developed. Arragonite is of the same chemical composition.

#### NATRON. SODIUM CARBONATE (impure).

"Natron is said to be abundant in some localities above Ava, where the Burmese use it for soap, and call it 'earth-soap.' This is the material of which Jeremiah speaks, 'Though thou wash thee with nitre,' and to whose effervescing property with acids allusion is made in Proverbs, 'as vinegar upon nitre.' In both instances the translation ought to be 'natron,' which abounded in Egypt, and was well known to the Jews."

### Group VI. HYDROCARBON COMPOUNDS.

#### PETROLEUM. NAPHTHA. EARTH OIL.

The commercial Rangoon oil is mainly derived from wells in Upper Burma, but a little has been obtained in the Thayet-myo district from wells sunk in the Tertiary sandstones, which are younger than the Nummulitic rocks of the district. An entirely different-looking oil to the thick "Rangoon" oil is procured from rocks of similar age as those which yield petroleum in Pegu, on the Arakan coast and some of the



adjoining islands. The Arakan oil is a clear thin liquid resembling sherry in colour, and with a peculiar opaline tinge, and this limpid oil would seem to be confined to the country near the coast and west of the Arakan range, as the darker oil is to the valley of the Irrawaddy and the country east of the same range.

#### AMBER.

This mineral is not found in Pegu, but Upper Barma "has long been famed for its amber mines, which are near the sources of the Kyen-dwen, where the district is called 'Payen-dwen' from *payen*, amber, and *dwen*, a pit." The mines however were even in 1837 approaching exhaustion, and Dr. Griffith only found about a dozen men employed in them. Anderson remarks that "the amber most valued at Monien is perfectly clear, and of the colour of very dark sherry, and is sold by its weight. A triangular piece of this kind, about one inch long, and one inch in its greatest diameter, cost about five rupees at Monien."

---

## ZOOLOGY.

THE zoological arrangement in the present Edition is a natural one, the lower forms being considered first and the chain of animated Nature being regarded as terminating in Man. The arrangement of the different divisions follows in the main the valuable little text-book entitled 'Zoological Classification,' by F. P. Pascoe, from which considerable extracts have been made. Pope, though profoundly ignorant of the scope and method of scientific zoology, yet formed through his innate strong sense a very just idea of its aims and results.

“ See, through this Air, this Ocean, and this Earth  
 All matter quick and bursting into birth.  
 Above, how high, progressive life may go !  
 Around how wide ; how deep extend below !  
 Vast chain of being ! which from God began  
 Natures ethereal, human, angel, man,  
 Beast, Bird, Fish, Insect, what no eye can see,  
 No glass can reach, from Infinite to thee ;  
 From thee to Nothing.

\* \* \* \* \*

All are but parts of one stupendous whole,  
 Whose body nature is, and God the soul ;  
 That changed through all, and yet in all the same ;  
 Great in the Earth, as in the ethereal frame ;  
 Warms in the sun, refreshes in the breeze,  
 Glows in the stars, and blossoms in the trees,  
 Lives through all life, extends through all extent,  
 Spreads undivided, operates unspent ;  
 As full, as perfect, in vile man that mourns,  
 As the rapt seraph, that adores and burns.”

### Sub-Kingdom I. PROTOZOA.

#### Class RHIZOPODA.

#### Order FORAMINIFERA.

To this order belong the beautiful little organisms (resembling *Nammulites*), which abound on many sandy beaches along the Arakan Coast, and look like some very white and flat pulse, less in size than a mustard seed. These shells are exquisite and complex structures, but as found on the shore are only dead and bleached. When alive, the chambers are filled with a gelatinous substance called 'sarcode' or 'protoplasm' endowed with life, as evinced by the power it possesses of assimilation and secretion, and to the operation of which, the varied forms of shell, both siliceous and calcareous, are due. To this order belongs one of the oldest

forms of life, *Eozoon* (though the claim of *Eozoon* to be regarded as an animal has been disputed), and both the white chalk of Old England and the Nummulitic limestone of Europe and Asia (extensively developed in Afghanistan) are largely made up of these organisms. A living species too is now filling up the Atlantic depths with the *Globigerina* ooze as it is called, and it is known that they are capable of existing alive at even such enormous depths as 2000 fathoms or more.

## Sub-Kingdom II. CŒLENTERATA.

### Class SPONGIA.

The sponges of Burma both marine and freshwater await investigation. They are "fixed aquatic organisms composed of an aggregate of amœbiform bodies, each provided with a mouth and numerous pores, and including a fibrous framework strengthened by horny, calcareous, or siliceous spicules. Larvæ free swimming" (Pascoc). Saville Kent describes them as "colony building, collar-bearing flagellate monads, exhibiting neither in their embryological nor in their adult condition phenomena that do not find their parallel among the simple unicellular protozoa." The spicules imbedded in the sarcodæ of sponges are beautiful objects under a microscope. Sponges are divided into three orders: *Myxospongiæ*, gelatinous sponges, without skeleton; *Fibrospongiæ*, with siliceous or horny skeletons; *Calcospongiæ*, with calcareous skeletons.

The second order embraces the family *Hexactinellidæ*, to which belongs that marvellous form *Euplectella*, or 'Venus flower-basket,' as it is called, a cornucopia-like structure of interlacing glassy threads; and the curious *Hyalonema* or glass rope sponge, so well described and figured in his 'Depth of the Sea,' by C. Wyville Thomson, allied forms to both of which may not improbably be met with in Burmese waters when the dredge has forced them to reveal some of their buried treasures.

### Class HYDROZOA.

Simple or compound organisms, the individual polypite consisting of a sac, composed of an outer and inner membrane inclosing a stomach, not differentiated from the general body-cavity, the opening furnished with tentacles. Reproduction takes place by ova or zooids, partially independent organs produced by gemmation. In this class alternation of generations occurs, that is, after some agamic generations, sexual organs are developed exterior to the body-cavity.

#### Sub-class HYDROIDA.

##### Order ELEUTHEROBLASTEÆ.

To this order belongs the common freshwater '*polypus*' (*Hydra viridis*) of Europe.

##### Order GYMNOBLASTEÆ.

##### Family Eudendriidæ.

EUDENDRIUM RAMOSUM, Armstrong. Arakan Coast, 10 to 70 fathoms.

##### Order CALYPTOBLASTEÆ.

LAFOËA ELONGATA, Armstrong.	Diamond I. between tidemarks.
HALICORNARIA SETOSA, Armstrong.	Cape Negrais and Cheduba, the Terribles, in 8 to 25 fathoms.
II. PLUMOSA, Armstrong.	Cheduba, 10 to 15 fathoms.
SERTULARELLA RIGOSA, Armstrong.	Arakan Coast, 10 to 15 fathoms.
THUMARIA COMPRESSA, Armstrong.	Diamond I. between tidemarks.
ANTENNELLA ALLMANNI, Armstrong.	Cheduba, 8 to 10 fathoms.

For descriptions of the above Hydroid zoophytes see Dr. Armstrong's Paper in Journal As. Soc. Beng. 1879, p. 98.

These animals are usually delicate plant-like forms, composed of colonies of social zoophytes attached to fixed objects, and their development is by 'buds' which on maturity are detached and float away, and are in their free stage of existence known as *Medusa*. "The Medusoid '*gonophore*' is composed of a swimming-bell (nectocalyx) with its inner margin produced into a delicate membrane called the 'velum,' its outer margin bearing the tentacles. From the centre hangs a tubular body, the manubrium, containing the body-cavity and acting as a polypite. The body-cavity is connected with four or more canals radiating to the circumference, and giving rise with their branches to a circular canal." (Pascoc.)

I quote so much of the life history of these animals as is probably not generally known, showing that many of the elegant free-swimming *Medusa* are merely the early stage of a fixed hydroid zoophyte.

#### Order HAPLOMORPHA.

These are the true *Medusa* or *Acalepha* of Cuvier, the embryos being developed from the parent, similia similibus, without passing through an intermediate stage of Medusoid '*gonophore*,' as in the last order.

#### Class ACTINOZOA.

The stomach is separated from the exterior wall by an intervening space, radiately divided into compartments by membranous partitions, wherein the reproductive organs are lodged. The ova develop into free germs with vibratile cilia (*Planula*). Reproduction is also effected by 'budding,' or by the separation of portions from the edge of the base (*Gosse*). Sexes either united or distinct.

#### Sub-class ZOANTHARIA.

Polyps with simple or occasionally branched tentacles, six in number, or a multiple of six.

#### Order MALACODERMATA.

To this order belong the 'sea anemones' which form so beautiful a feature in a well kept aquarium, but the Indian forms have as yet received little attention. They have no skeleton, and are mostly solitary—the *Zoanthidæ* only being united by a common stem.

#### Order SCLEROBASICA.

This order embraces the branching horny 'corals' devoid of a rigid skeleton.

#### Order SCLERODERMATA.

These are the stony corals, including those species which in tropical seas form coral reefs. The animal of the coral is of a gelatinous consistency, the 'coral' being the common skeleton of countless thousands of the coral animals, to which the 'coral' owes the vivid hues it presents during life. No attempt has as yet been made to catalogue the corals on the coast of Burma, though a few species procured by myself are in the Indian Museum at Calcutta.

#### Sub-class ALCYONARIA.

Polype with eight pinnately fringed tentacles in one series.

#### Order ALCYONIACEÆ.

Ectoderm leathery with calcareous spicules imbedded. No sclerobasis. Permanently rooted.

#### Family Alcyoniidæ.

*NEPHITHYA*, sp.

Arakan.

A single specimen (which Dr. Gunther was unable to determine specifically) was obtained by me on the coast (W. T.).

## Order GORGONIACEÆ.

To this order belongs the 'red coral' of commerce, a species found in the Mediterranean Sea only, and which has no relation to those lumps of red coral in the form of aggregated pipes (*tubipora musica*), which one sees in all collections of shells and miscellaneous curiosities from tropical ports.

## Order TUBIPORACEÆ.

Coral in the form of tubes, bound together by horizontal plates. No septa. Polypes completely retractile, those of the common red organ-pipe coral (*tubipora musica*) being of a violet or grass-green colour during life.

## Sub-Kingdom III. ECHINODERMATA.

"All echinoderms have a calcareous skeleton, and many are provided with moveable spines. A characteristic apparatus of vessels termed the ambulacral or water-vascular system is present. It is composed of a ring round the pharynx, from which proceed a number of radiating canals commonly giving off caecal appendages, as well as branches, which enter the retractile tube-feet, often furnished with a terminal disk or sucker, which with the spines are the organs of locomotion." (Pascoc.)

## Class CRINOIDEA.

To this class belong the 'sea lilies,' so numerous in *Palæozoic* and *Mesozoic* seas, and whose joints form no inconsiderable portion of some ornamental marbles. The *Comatulidæ* of the present seas belong to the same class, the immature *Comatula* being fixed on a stalk like the old 'sea-lilies,' but the adult animal becoming free and capable of locomotion.

## Class STELLARIDÆ.

## Order OPHIUROIDEA.

The disk is entire and contains the viscera. The arms are attached to, but are not prolongations of the disk, and are formed of four rows of calcareous plates. The arms are devoid of suckers, and are themselves the organs of locomotion. The arms are extremely brittle and are spontaneously detached, if the animal is molested, whence the popular name of '*Brittle stars*' which they have received. Some species of these '*Brittle stars*' abound under stones at low water on the coast of Burma, but have not been specifically identified.

## Order ASTEROIDEA.

The disk is more or less lobed, the lobes being prolonged into arms which are channelled below, and contain prolongations of the viscera. The arms are freely provided below with suckers, which constitute organs of locomotion. This order embraces the common star-fish of the British coast, which is such a pest to the oyster-banks, that mollusk forming its favourite food, and no doubt the pearl-oyster suffers in a similar manner. Imaginative people have supposed that the '*star-fish*' watches its opportunity and adroitly inserts a stone between the valves of the oyster to prevent it closing its shell, but this is not credible—the particular inducement, however, which the *star-fish* employs, when desirous of putting himself in communication with the oyster, is not very evident.

## Class ECHINOIDEA.

This class embraces the multitudinous forms of ordinary echinoderms, *sea-urchins*, *sea-eggs*, *sea-pencakes*, etc., numbers of which occur on the coast, but none of which have been specifically identified. The flesh of the larger species is esteemed for food. Many species secrete themselves in holes in rocks, and once fairly in its hole, it is a matter of the extremest difficulty to extract the recalcitrant animal without damage, so tightly does it grip the sides of the cavity with its spines.

## Class HOLOTHURIOIDEA.

Body cylindrical or vermiform, with a coriaceous skin, in which granular particles are scattered, and usually with five longitudinal rows of ambulacral suckers.

There are two orders: *Apneumona*, which are hermaphrodite, and possess no special organs of respiration; and *Pneumonophora*, with the sexes distinct and possessing internal arborescent branchiae.

## Order PNEUMONOPHORA.

## Family Holothuriidæ.

## HOLOTHURIA.

This genus embraces the sea-eucumbers, '*Trepang*' or '*bêche de mer*,' as they are called, very repulsive-looking animals, but valuable in an economic point of view, as vast numbers are collected for export to China, where they are highly esteemed as food. Some species of *Holothuria* attain three feet in length, and they possess the extraordinary power of ejecting their own bowels if molested. This strange act, however, does not seem to interfere with the comfort or health of the animal, which in some three months will reproduce a new set.

## Sub-Kingdom IV. VERMES.

Body generally elongate or vermiform, soft, bilaterally symmetrical. Feet if present never jointed.

## Class PLATYELMINTHIA.

## Order TURBELLARIA.

Non-parasitic and mostly aquatic animals. Some species are 'commensals' or non-parasitic lodgers in *Holothurians* or in the respiratory cavities of *ascidian tunicaries*, claiming shelter only from their hosts, and a few reside in moist earth.

## Family Planariidæ.

The *Planarias* are found under stones in damp places, and resemble an elongated or vermiform slug with a T-shaped head, but may be discriminated from mollusca by wanting tentacles. Some species occur in Burma.

## Family Amphiporidæ.

To this family belongs the singular *Nemertes*, a marine worm of slender diameter, but some species of which attain 200 feet in length. These predatory worms harbour under stones, and so entangle their labyrinthine folds among the gravel wherein they reside, that it is next to impossible to capture a perfect specimen.

## Order TREMATODA.

External or internal parasites on *mollusca*, *crustacea*, and various organs and parts of all species of *Vertebrata*. The common and destructive *Distoma hepaticum*, or 'Liver fluke' of the sheep, is an example of a *Trematode* worm.

## Order CESTODA.

The order of *Cestoid* worms embraces the most repulsive parasites of man and animals, often endangering health by their presence, but which yield to no animals perhaps in the curious and chequered career which they undergo during their existence.

"In the more typical forms these parasites are composed of a head, which is the true animal, the joints being the hermaphrodite reproductive organs, developed by a process of gemmation from the head. The joints are called 'proglottides,' and are organically connected by the water-vascular system. There is only one proglottis in *Caryophyllaidæ*, but in *Tenia solium* there are sometimes as many as 800.

"Although the 'proglottides' are only produced in the alimentary canal of man, or some other warm-blooded animal, it is necessary for the evolution of an embryo, that the ovum should be swallowed by some other animal than the one inhabited by the mature worm. When the fecundated 'proglottides' therefore are expelled, the ova are liberated, and should an ovum get into the alimentary canal of a vertebrate, the embryo (now called a 'proscölex'), set free from its covering, proceeds to bore with its spines through the tissues of its 'host' until it finds a resting-place, then it surrounds itself with a cyst, and a vesicle containing a fluid is developed; it is now called a 'scölex.' These cysts were also known as 'hydatids.'

"When ova of the pork tape-worm (*Tenia solium*) gains access to the alimentary canal of a pig, their shells become digested, and the inclosed six-hooked embryos escape, and bore their way into the circulation. Thence they proceed to the cellular tissue and become transformed into 'measles' (*Cysticercus cellulosa*). In the sheep the cystic worm of the brain (*Canurus cerebralis*), which causes the 'gid' or 'staggers,' becomes the *Tenia canurus* of the dog. The *Cysticercus pisiformis*, or 'pea-measle' of the rabbit, is the 'scölex' of *Tenia serrata* infesting the dog. The *Cysticercus fasciolaris* of the mouse becomes the *Tenia crassicollis* of the cat. The common hydatid (*Echinococcus veterinorum*) becomes the *Tenia echinococcus* of the dog. The slender-necked hydatid (*Cysticercus tenuicollis*) of the sheep becomes the *Tenia marginata* of the dog. The *Cysticercus talpæ* and *C. longicollis* infesting moles become respectively the *Tenia tenuicollis* and *T. crassiceps* of the fox. Lastly a 'scölex' called *Staphylocystis micracanthus*, which is found in a myriapod (*Gloveris*), is the larval stage of *Tenia pistillum* infesting shrews (*Sorex*)." (Cobbold, quoted by Pascoe, op. cit. p. 53.)

The risk a man runs of eating the 'scölex' of a tania in a piece of pork or beef, and thereby introducing a tapeworm into his alimentary canal, is far less than that which arises from swallowing its 'ovum.' This latter is hatched in his stomach, whence it bores its way into his tissues, as it would into those of a pig, causing the man to be 'measly,' *vice* the pig. Van Beneden describes one possible and highly painful result: "We have lately read an account of the effects produced by one of these wandering worms on a man who died after suffering from a peculiar disturbance of the mind. Two spirits seemed to haunt and speak to him, the one a German, the other a Pole. Filthy images were called up before his imagination. At the *post-mortem* examination 'cysticerci' were found to occupy the 'sella turcica' near the commissure of the optic nerves. One of these was alive, the others were calcified. Two others in a similar condition occupied a lobe of the brain." What a lesson of caution and forbearance in our judgment of our afflicted brethren does not this teach us. Doubtless many who knew this poor man put down his sufferings as the result of an immoral and wicked frame of mind, while all the time the poor wretch was helplessly suffering from a wandering 'scölex,' which had established itself in his *cerebellum*. Immoral ideas are often the direct result of injury to or disease of the *cerebellum*, and who shall say in such sad cases that a wandering 'scölex' imbedded in that organ is not the truly responsible cause?

In the tape-worm (*Tenia*) each new joint is formed between the head and the next joint, so that the maturity of the joints bears some proportion to their distance from the head. The dislodgement and expulsion of these creatures from their intestinal abode is extremely difficult, and the best mode of guarding against their invasion is to eat no raw or underdone meat, as thorough cooking is destructive to the 'scölex,' but no meat is safe in this respect which when cut displays a sanguineous hue in its juices. The 'Cysticercus' of beef, it may be added, produces the *Tenia medio-canallata* in man. Of the 'gid' in sheep a few remarks by Van Beneden are worth quoting. A sheep in pasturing swallows an egg of the *Tenia canurus* dropped by some passing dog. The 'scölex' finds its way to the brain, and in fifteen days the first symptoms of 'gid' appear. The sheep necessarily dies at last, unless the parasite is removed by the 'trepan.' To arrest the spread of the disease only one thing is necessary, to destroy by fire the head of every sheep attacked by the 'gid,' so as to prevent its 'cysticercus' passing into the stomach of any carnivorous animal; as the mischief may be indefinitely propagated by such

neglect. The head abstracted and burned, the rest of the animal may be eaten with impunity, as the dire pest is confined to the cerebral region alone.

## Class NEMATELMINTHA.

### Order NEMATODA.

Worm-like or filiform parasites with no segments, and neither circulatory nor respiratory organs. Sexes separate.

The common *Gordius* or 'thread-worm' of stagnant water is a familiar example of this order. So too are the *Anguillula* or vinegar and paste 'eels,' and the formidable 'Guinea worm.' In its young state this worm resides in water, and was once supposed to be able to penetrate the skin of the bather, sportsman, or water-carrier by means of one of the sudorific pores. It is now, however, believed that it enters the system in drink, and the use of filtered water is our best protection against its invasion. Once however, located in the body, it develops to a length varying from six inches to twelve feet (Pascoe), but of no greater thickness than two-thirds of a line.

Another curious 'Nematode' is *Sphaerularia bombi* infesting the humble bee. The pregnant womb of a female of this species is 28000 times larger than the animal to which it belongs, and as this prodigious development has obliterated every original passage, parturition is only possible by the literal falling to pieces of the unhappy mother. Two most fearful parasites also belong to this order. *Strongylus gigas*, the great kidney-worm, which grows to three feet in length, and selects for its abode the kidneys of dogs, wolves, and man, and the terrible *Trichina spiralis*, which resides in the muscles of its victim, 700,000 having been counted in one pound of the flesh of a man! The original source of this pest is said to be the rat, but it is received into the human frame by means of pork, and unfortunately neither salting nor cooking would seem to destroy the vitality of the germs. The utmost care should therefore be used in the selection of pork for food, and as a precautionary measure especial care should be used to prevent pigs eating rats; indeed, the more cleanly in its house the pig is kept, and the cleaner its food and water, the safer will be its flesh for man's consumption. Other noteworthy *Nematodes* are the common *Ascaris lumbricoides*, the *Syngamus trachealis*, whose presence in the windpipe causes the 'gapes' in poultry, and the *Dochmius duodenalis*, which, according to Pascoe, infests a fourth of the entire population of Egypt. As an example of the life history of a *Nematode*, the following account may be quoted (from Van Beneden's 'Animal Parasites') of *Ascaris nigro-venosa*, whose abode is alternately the lungs and the rectum of a frog. This *Ascaris* is a true parasite, which, when it arrives at its destination (the frog), where it finds lodging and food, leaves the lungs, to go and inhabit another organ. Here we have decided changes of abode in the same animal; that which shows besides that it is not a simple accident, is that the animal is of a different sex according to the apartment (lungs or rectum) which it occupies; here it is hermaphrodite, there it is male and female. In the lungs it is very small and viviparous, and produces young ones, which become stronger than their parents. The generation which live in the lungs are hermaphrodite: the others are diceious, that is to say, the males and females have hermaphrodites for their parents. We have thus a mother, a simple female or hermaphrodite, very small, which produces *not* eggs, but young ones fully formed, and instead of living like the mother, in the lungs and breathing there with greater or less facility, they go and lodge in the rectum, and become *not* like their mother, viviparous and hermaphrodite, but oviparous and of separate sexes. They produce in their turn a race, which instead of following the example of their father and mother, all go off and take up their abode in the lungs like their grandmother.

## Class ANNELIDA.

Body segmented, legs none or rudimentary.



## Order HIRUDINEA.

A suctorial disk at one or both ends, by which progression is effected. Most species are aquatic, and many parasitical.

Leeches both land and water are tolerably numerous in Burma, but have not been specifically determined, and the same remark applies to the next order.

## Order OLIGOCHÆTA.

To this order belongs the family *Lumbricidæ*, embracing the common earth worms.

## Order CHÆTOPODA.

To this order belongs the family *Arenicolidæ* or common sea worms, as the *Arenicola piscatorum*, so useful for bait, which dwells in sand and sandy mud between tidemarks on the English coast, and is doubtless represented by allied forms in Burma.

## Order CEPHALOBRANCHIA.

To this order belongs the family *Serpulitæ* or marine worms, protected by a shelly tube. These worms respire by branchiæ attached to the head, and the tubes wherein they reside are either secreted by them, or built by the animal agglutinating grains of sand together to form the tube wall. Many of them were formerly regarded as mollusks.

## Order ROTIFERA.

Minute aquatic animals which undergo no metamorphosis, are rarely parasitical, and have the sexes distinct. The name 'wheel animalcules' is applied to them, from the anterior end being furnished with one or more retractile disks bearing cilia, which when vibrated produces the appearance of a wheel rotating. The Burmese species are entirely uninvestigated.

## Class POLYZOA.

This class, more commonly known as *Bryozoa* or Corallines, are marine organisms found in social colonies, some of which are often taken for seaweed, whilst others spread over or encrust submerged objects.

## Sub-Kingdom V. ARTHROPODA.

Segmented animals with distinctly jointed legs. Nervous system ganglionic. Sexes usually separate.

## Class CRUSTACEA.

Crustacea are remarkable for the metamorphoses through which they pass, and it was long before the connexion was discovered between some of these larva forms and the adult animal into which they developed. "Some of the lower forms of Crustacea retrograde after passing the embryonic stage, but an advancing and gradual metamorphosis is more general. Three larval forms may be distinguished. 1. *Nauplius*. Oval, unsegmented, one eye, three pairs of appendages, which are converted into antennæ and gnathites (masticatory organs). 2. *Zoëa*. Elongate, segmented; thorax with a dorsal spine, two sessile eyes, abdomen as long as the body, legs rudimentary. 3. *Megalopa*. Flattened, segmented, no dorsal spine, two pedunculate eyes, abdomen much diminished, partially bent under the body; five pairs of legs" (Pascoc, op. cit.). The lower crustacea do not pass the *Zoëa*-stage, and some go through the *Nauplius*-stage in the egg.

## Sub-class CIRRIPEdia.

Body inclosed in a carapace formed of many pieces. Feet in the form of cirri. Sexes usually united in the same individual, but when distinct, the males are of minute size and are epizoid or live on the bodies of the females.

## Order THORACICA.

Family **Lepadidæ.**

This family embraces the pedunculate cirripeds, the *stalked Barnacles*, or '*goose barnacles*' as they were sometimes called, from the absurd idea that they produced the 'barnacle Goose.' The leathery stalk or 'peduncle' by which they adhere to ships' bottoms or floating timber, is formed by "a modification of the larval antennæ."

Family **Balanidæ.**

The sessile cirriped, or *common Barnacles* are contained within a conical multi-valve shell, closed by an operculum, composed of four pieces. The whole shell has a cellular and organized texture, and by the chambered structure of its walls, is said to have given the idea to shipbuilders of the double skin or cellular arrangement of iron plates in a ship's hull or a bridge girder, which so materially adds to their strength, with a minimum amount of material. The cement by which the animal fixes itself to its selected site, is secreted by an organ, which Darwin has shown to be a modified portion of the ovarian tube.

Sub-class **EPIZOA.**

These animals are external parasites of grotesque form, on fish and other marine and freshwater animals. Their mouth is suetorial, they possess no respiratory organ, and the females carry two external and pendant ovisacs. There are two orders, Siphonostoma and Lernæodea.

Sub-class **ENTOMOSTRACA.**

Body protected by a carapace composed of one, two or more plates or valves. Limbs jointed, setiferous. Sexes separate, but agamic reproduction (*Parthenogenesis*) is "not uncommon" (Pascoc). They are mostly freshwater animals of minute size. There are five orders, *Copepoda*, *Ostracoda*, *Cladocera*, *Phyllopoda*, and *Xiphura*, besides the extinct order of *Trilobites*, which so swarmed in Palæozoic seas.

The order *Xiphura* embraces the king crabs (*Limulus*), one or two species of which are common on the Arakan coast (*L. rotundicaudatus*, Edw., and *L. Moluccanus*, Edw.).

Sub-class **EDRIOPHTHALMA.**

This sub-class comprises three orders, Læmædipoda, Amphipoda, and Isopoda.

The common '*wood louse*,' *monkey pea*, or *sow-bug* (*Oniscus*) is an example of a terrestrial *Isopod*. *Ega spongiophila* resides inside the beautiful siliceous sponge *Euplectella aspergillum*, within which its exuvie may generally be noticed. "*Bopyrus squillarum* is found commonly under the skin of prawns, *Liriope* is a parasite on *Pellogaster*, itself a parasite!" (Pascoc).

Numberless animals of this interesting sub-class occur in Burma, but they all await the coming "vates sacer," who is to bring them to notice and record their manners and development and names. A fund of curious information regarding them is contained in Van Beneden's "Animal Parasites."

Sub-class **PODOPHTHALMA.**

## Order STOMATOPODA.

Branchiæ external, either beneath the abdomen, or attached to the thoracic legs. Rarely rudimentary or wanting. Carapace generally thin, and covering the whole (or part) of the thorax. Abdomen elongate and ending in a "natatory tail." The 'gnathites' are confined to a pair of mandibles, two pairs of maxillæ, and a pair of foot-jaws which are sometimes rudimentary, or are connected, as well as the seven succeeding pairs of limbs, with natatory feet (Pascoc).

Some species of this order are important as food, as *Squilla*, or the 'sea mantis' which is an excellent article of diet, and sold in the Bazaar of Akyab and other places. It is a pretty sight to see these elegant creatures gliding with indescribable ease and grace through the rock pools left by the tide, but woe be to the hand that attempts their capture. With a 'click' made by suddenly releasing from some catch one of their sharp anterior limbs (as I presume) they inflict a severe wound, a very small specimen once cutting me to the bone, and I have little doubt that a large individual would be almost capable of amputating a man's hand at the wrist, or at least of severing the sinews and arteries, and causing dangerous hæmorrhage.<sup>1</sup>

### Family Squillidæ.

SQUILLA NIGRA.	Akyab.
„ RAPHIDEA.	Rangoon.
„ SCORPIO.	
The Karens, says Dr. Mason, term <i>Squilla</i> 'the water centipede.'	
GONODACTYLUS CHIRAGRA.	
„ TRISPINOSUS.	

### Order DECAPODA.

Branchiæ inclosed in a special cavity on each side of the thorax. Five pair of legs, the first being didactyle or clawed. The growth of these animals is provided for by a 'moult,' at which time the shell splits up and the naked animal, invested merely with a soft 'pellicle,' emerges, and during the next four days increases rapidly in size, after which time the carapace hardens and there is an arrest of growth till the next 'moult.' These '*soft crabs*' are much sought for as bait, but before the time comes they usually retire to holes to be safe in their unprotected state from their many enemies. Sometimes, too, one of a couple will during this trying time take charge of his or her mate, and I have seen the utmost care and solicitude evinced by an ordinary crab, for a helpless and shell-less individual whom he was carrying about in his arms.

### Tribe MACRURA.

The abdomen well developed; the first five segments bearing natatory limbs, and the sixth forming (except in Paguridæ) a terminal quinque-partite fin. To this section belong the lobsters (*Homarus*), *Nephropsis*, a curious deep-water form from the Bay of Bengal, the shrimps (*Crangon*), the prawns (*Palæmon*), the sea crawfish (*Palaemon*), the river crawfish (*Astacus*), and the 'hermits' (*Pagurus*).

<sup>1</sup> The present list of crustacea is less perfect than I had once hoped would have been the case. On two different occasions I presented the whole of the Marine crustacea collected by myself on the Arakan coast to the Indian Museum, with the sole but distinct proviso that I should have a single named set returned to me. This not unreasonable request of mine was never complied with, and was at last practically repudiated. I was furnished (at my request) with a list of Burmese Crustacea drawn up by Mr. Wood-Mason under orders of the Trustees. This list embraces thirty-six marine species arranged *alphabetically*. To have arranged them thus must have cost some little pains, and could only have been so done in order to give embarrassment and to diminish as far as possible its value to myself scientifically. Any errors therefore in distributing these species in the families they are ranged under in the present list, must be regarded as due to myself, and not to Mr. Wood-Mason. An independent application was also made by the Chief Commissioner of British Burma to the Curator of the Indian Museum for lists of Burmese invertebrates contained in its collections, but the application was refused by the Trustees on the following ground: "Until the collections are distributed and catalogues completed, the preparation of special lists such as those required involves more time and labour than can be spared in justice to more urgent duties." Now it may be very safely assumed that the above sentence was not intended by the Honorary Secretary of the Trustees of the Indian Museum as an unseemly joke, but such it certainly must be regarded by any one who possesses slightly clearer conceptions of a Curator's duty than those entertained by the Trustees. The officers of the Indian Museum can find plenty of time to contribute papers to scientific periodicals on subjects interesting to themselves, but shrink from the drudgery (as they seem to deem it) of one of the first and most obvious duties of a Curator, the cataloguing of the collections under his charge. The species marked \* are not included in Mr. Wood-Mason's list. (W. T.)

*Family Galatheidæ.*

GALATHEA ELEGANS.

*Family Alpheidæ.*

ALPHEUS, sp.

Arakan.

*Family Thalassinidæ.*

THALASSINA SCORPIONOIDES.

This is a remarkable form, very elongate, and a redoubted burrower, classed by Milne-Edwards in his tribe of *Cryptobranchides Fouisseurs*. Whoever has walked through mangrove swamps must have remarked, in spots where the ground was rather sandy and elevated, great heaps of dark sandy mud, ejected by some animal from its burrow, the material brought up being moulded into rude balls, of sizes proportionate to the occupant of each hole, some heaps being composed of balls the size of walnuts, others of various smaller dimensions. It is wonderful to think how so friable a material as this sandy mud often is, can be moulded into such forms, and still more when it is found that the animal which brings up these incoherent balls of sand is a crab, whose hard claws (if they are the organs employed) seem but ill adapted for such work. The burrows of these crustaceans are a couple of feet or more deep, and rather difficult to follow, and would seem to be carried down to a depth at which water is met with at any state of the tide. The animal resembles a small, very elongated, lobster more than anything else, of a ruddy brown colour, with two narrow and unequal claws, and when extracted from its burrow is somewhat sluggish and helpless, and its habits would doubtless well repay a careful study.

*Family Astacidæ.*

NEPHROPSIS, Wood-Mason.

Differs from *Nephrops* in wanting the antennal scale.

Mr. Wood-Mason thus writes of this interesting form: "The discovery in these warm seas of a very near, of the nearest ally in fact, of so characteristic a cold-water species (*Nephrops*), remarkable though it is, will not appear so surprising when I mention the fact that my crustacean lived and burrowed in the mud of the sea-bed at a depth of nearly 300 fathoms in a temperature not certainly exceeding 50° Fahr.

"One of the chief points of interest attaching to this new form lies in the loss of its organs of vision by disuse, as in *Calocaris MacAndrewæ*, Bell, and *Cambarus pellucidus*—a member of the same family as that to which *Nephropsis* belongs—and in the other crustaceans and animals inhabiting the caves of Carniola and Kentucky. I not only agree with Mr. Darwin in attributing the loss of the eyes to disuse, but I also regard the great length and delicacy of the antennæ, and the great development of the auditory organs as modifications effected by natural selection in compensation for blindness."—J. A. S. B., 1873.

\*N. STEWARTI, Wood-Mason.

Dredged off the Andamans.

The type was a female. Length of body 4 inches, of antennæ 7.25 inches.

EUTRICHOCHELES MODESTUS.

A small crustacean which Mason terms the "mangrove-swamp prawn," burrows in considerable numbers in the banks of tidal creeks intersecting the mangrove swamps. It is some two inches in length, with very unequal claws, one being very stout. It is, I think, this creature which produces the curious metallic 'click' one often hears when gliding in a canoe at low tide through these narrow channels.

## Tribe ANOMURA.

## Family Paguridæ.

CENOBITA RUGOSA, Herbst.

,, SPINOSA.

\* ,, CLYPEATA.

\* ,, OLIVIERI.

How these crabs swarm on the Nicobars may be judged from the following account by Mr. Hume of what he saw on landing in Gadatea Bay. "The whole beach was coated with a layer of dead shells, and every other shell, big and little, contained a 'hermit crab.' These crabs were of all sizes—there were millions of them—their numbers were alike incredible and bewildering; from the water's edge well into the jungle and in and about every hole and cranny in all the outermost trees, up to the height of at least 20 feet, it was Crabs, Crabs, Crabs. A few of *Diogenes* and *Pagurides* at the water's edge, but practically all of them *Cenobitas*, *Olivieri*, a bright scarlet, brighter than that of any boiled lobster. *Rugosa*, a beautiful purple, and *Clypeata*, mauve, with a blue or brown spot on the big claw. I was perfectly fascinated with these crabs, their omnipresence to begin with was overwhelming. They were so amusing, everywhere were little breakfast parties. A great Barringtonia fruit as a pièce de resistance, surrounded by a small family circle, individuals of all sizes, all eating away as if their lives depended on getting down the greatest quantity in the smallest possible time. Between my very feet as I stood motionless, watching the busy crowd, a large red fellow came along in a most disreputable shell clearly too small for him, and meeting a small purple chap in an eminently desirable residence, he pounced upon him and had him out of it in a jiffy, and slipped into it himself, while the evicted tenant had in another minute suited himself with a new abode, and straightway toddled off as lively as if nothing had happened. Now how did this big crab get the smaller one out? You may haul away from the outside and pull the things to pieces, you can never get him out, and I want to know how the other crab managed it? If you have a lighted cheroot the thing is easy. You apply the lighted extremity to the upper end of the shell and pull vigorously. The crab begins to show signs of uneasiness, he looks out and feels about with his claws, sees something hideous (yourself), concludes that the sun is rather hot, and retreats to continue his siesta. After another minute or so he decides that the sun is really getting unbearably hot, and that he will go off and finish his nap in the shade. Out again come the claws and legs. 'Hullo,' he says, 'nothing to be touched; very odd this; something up,' and pops back again. Then you bend slowly down till the shell just touches the beach, and by this time he has come to the conclusion that his house is certainly on fire, and he scuttles away shell-less, dragging his slug-like posterior extremity after him without much difficulty for about a yard, after which he sits down, having wriggled his tail between some stones and shells, to consider the position of affairs; presently legs and claws are all extended, feeling here, there and everywhere for a shell, then a shell is drawn nearer, closely examined and rejected, then another and another, but none suit, and he drags himself away another foot, and as usual immediately collapses and remains motionless in a doubled-up position for a minute before he resumes his search for a suitable lodging. At last Eureka, he has pleased himself, he places the shell conveniently, turns round and pops in."—Stray Feathers, vol. ii. p. 75.

\*BIRGUS LATRO. Leach.

The great Cocoa-nut Crab.

According to Mr. Cumming this species feeds on the fruits of the *Pandanus*, as well as the cocoa-nut, and is prized as food by the natives of the South Pacific Islands.

In the Nicobars, however, it is very different, and a Nicobar man would as soon think of eating his grandmother as one of these crabs. The following is Mr. Hume's description of the capture of a specimen of this crab on Meroe, one of the Nicobar group, and the circumstance which led to it. "It had been a very trying day, every

one had been working in the breathless heat of a dense tropical jungle the whole day from early morning till evening, except during the short time it took us to run from Treis to Meroe. The sun was now near setting, and the Captain, who did not like our position, and who had strictly ordered that all boats were to be aboard by sunset, fired a gun for the remaining boat. One or two lascars and one European made their appearance on the beach; but after loitering there opposite the boat for some time, turned back again and disappeared. The sun had now *set*, a second gun was fired, of which no one took the smallest notice. By the waning light we could still make out with our glasses the boat anchored outside the heavy surf, and the canoe hauled up upon the beach. We heard several shots fired from time to time. Then we fired a third gun, but the rising moon showed boat and canoe 'as you was,' and that no sort of attempt was being made to acknowledge our summons. The Captain (liking, as most captains do, to have his orders attended to) began to get angry. A boat was now launched, and the second officer sent off to order the immediate return of the boat. The Captain expressed his intention of favouring the chief officer when *he* did come with a piece of his mind, and was very wrath. We watched our messenger boat anxiously, the wind was against her and the sea rather rough; at last we made out that a landing had been effected. Then for a long time was silence and darkness, for clouds veiled the moon. We waited, waited, waited, at last out came the moon, and we saw our boat with sail up gliding rapidly towards us. With a fair and steady breeze and a first-rate sailor at the helm, that boat could not have been very long making the ship, but seemed to us an age. When it did come, D. was up the companion-ladder in a moment, and in another was on the poop. He brushed through us without a word, and walked straight to the Captain, who stood quietly by the binnacle, touched his cap, and made the usual report, 'Come on board, Sir.' The Captain on his part had never moved an inch; he merely said, 'Why is the cutter detained?' Again the touch of the cap, '*Dr. Stoliczka is lost, Sir!*' Then D. told us that towards sunset the chief officer and Mackay (the executive engineer at Port Blair, who had joined our party), though already fairly worn out, had started in opposite directions to round the island, a work of inconceivable difficulty, cruel thorny jungle plunging down into the surf, alternating with knife edge reefs of coral and deep pools, and that they had only succeeded in making their way back to the landing-place after D.'s arrival, their shoes and clothes cut to pieces, and that he had left them exhausted on the beach.

It was at once decided to send out the strongest expedition we could muster. Every one that could be spared, though most of these were dead beat, volunteered, even Dr. Dougall, who never would be bothered landing anywhere, with the true instinct of his profession, now that there was real hard work to do, was one of the first in the boats. It was past ten before the expedition got off, and near eleven before the first signal rang out 'all landed safely'—welcome enough in its way, considering the surf through which no English boat could live a moment, and the necessity of landing two at a time in a frail canoe.

It was half-past one, when suddenly a faint flickering light glimmered out towards the end of the jungle, like a star struggling through a thick cloud; then it grew a little brighter, then a second light appeared, and we saw men coming to the water's edge. Three guns were now fired, the signal of 'all well,' followed by three ringing cheers, and the Philosopher was found. It seems that in working his way back to the landing-place he had become involved in a cane jungle, in which, after struggling for some hours, he had sunk exhausted till rescued by the party despatched in search of him, and even they would probably have failed to make their way through the terrible thickets, but for the aid rendered them by a couple of Nicobarese well used to the work, armed with axes and cutlasses to clear a way by a union of skill and force. In so doing, they had it seems caught occasional glimpses of what looked like big spiders scuttling past; and when the Philosopher was found, and they were all on their way back to the boat, the 'Geologist' with a rush put his foot on one, and, despite its vehement struggles, held it till a light was brought. Then it appeared that the supposed spider was a gigantic crustacean of the most dangerous and pugnacious nature. After many attempts he was secured with creepers,

and was being borne along in triumph, when Davison, approaching him too nearly, had his coat seized and literally torn off his back. However, at last his claws were wedged, and though in coming off the canoe was upset, and some of the party had to swim for it, the crab came safely on board. The delight of *our* Crustacean, when this near relative of his was presented to him, may be imagined, since he turned out to be by far the finest and largest known specimen of the great robber crab, *Birgus latro*. Wherever we had landed on the Nicobars, we had found hundreds and thousands of coconuts, each with a large neat circular hole cut into the centre of one side, right through husk (often  $2\frac{1}{2}$  inches thick) and shell, and with the whole contents scooped clean out. This the Nicobarese declared was the work of an objectionable sort of devil or scaly dragon, as it was described to us, which ascended the trees at night, and cutting off the finest nuts, devoured them on the ground. Here then was the Devil or Dragon! No sooner was it caught, however, than the Nicobarese were very anxious that it should be released, assuring us that it was a dangerous demon to meddle with, and if hurt would bring fire and death into their homes. The upshot was, however, that he was consigned to a tub of spirits, where," as Hume adds, "his mortal remains will long I hope continue an ornament and attraction to the Indian Museum, where they are deposited."—*Stray Feathers*, vol. ii. p. 9t.<sup>1</sup>

#### Tribe BRACHYURA.

Abdomen reduced to a small 'apron,' or tail, lodged in repose in a depression in the breast, and without any fin. In the male this 'apron' is triangular, in the female it is broad and rounded, whereby the sexes may be easily distinguished.

#### Family Leucosiidæ.

IPHIS SEPTEMPINOSA.

MYRA ELEGANS.

MATUTA VICTOR.

#### Family Parthenopidæ.

PARTHENOPE CALAPPOIDES.

#### Family Grapsidæ.

GRAPSUS STRIGOSUS.

Akyab.

GONIOGRAPSUS THUKUJAR.

SESARMA TUBERCULIMANA.

Maulmain.

#### Family Gecarcinidæ.

Land Crabs.

CARDISOMA CARNIFEX.

HYLÆOCARCINUS HUMUL, Wood-Mason. Nicobars and Narkondam.

This genus is intermediate in its characters between *Pelocarcinus* and *Gecarcinus*. It is a notable fact, Mr. Wood-Mason adds, that *Gecarcinus ruricola*, *Pelocarcinus Lalandei*, and *Hylæocarcinus Humul*, have all shallow yellow scars situated in all three, on each side of the eye, and on other parts of the carapace, tell-tale marks of their descent from a common ancestor (J.A.S.B. 1873, Part II. p. 258).

#### Family Thelphusidæ.

The freshwater crabs are ranged in a family by themselves, of which two genera are represented in Burma. The banks of every stream on the mountains, the fields where rice is grown, and the banks of tanks are alike perforated by their burrows, but the animals are nocturnal, and save in the rainy season, are not often seen out of their holes. They produce large eggs, and the female hatches and carries her young about her, sheltered by her 'apron.'

<sup>1</sup> The Philosopher, Geologist and Crustacean were respectively Ferdinand Stoliczka, Valentino Ball and James Wood-Mason.

THILPHUSA	EDWARDSI, Wood-Mason.	Khakyen Hills. Hotha.
„	ANDERSONIANA, Wood-Mason.	Khakyen Hills. Monien, 3500-5000.
„	HISPIDA, Wood-Mason.	Khakyen Hills. Pensee.
„	TUMIDA, Wood-Mason.	Khakyen Hills. Hotha.
*	ATKINSONIANA, Wood-Mason.	Arakan.
PARATHILPHUSA	DAYANA, Wood-Mason.	Prome. Mandalay.
„	CRENULIFERA.	
„	SINENSIS.	

#### Family Ocypodidæ.

Dr. Mason gives \**Ocypoda ceratophthalma*, as found on the coast, apparently on Mr. Blyth's authority, but the species is not included in Mr. Wood-Mason's list. Either this, or an allied species, is one of the most striking objects seen, when strolling by moonlight on a firm sandy beach, though they are by no means solely nocturnal animals. These crabs are of a bright-red colour, with eyes supported on pedunculated porcellaneous cylinders. As the intruder approaches over the sands, the assemblage of these animals opens out to allow him to pass, or if his movements are suspicious, they betake themselves, each to the immediate entrance to his own hole in the firm sand, and if their alarm is raised, the whole of them will disappear as if by magic, leaving a clear beach, where scores of active crabs were the previous instant seen moving about. When watched from a distance, however, the motions of these crabs are very interesting, as the whole body wheels this way and that, somewhat like troops manœuvring at a review.

The following interesting remarks are from the pen of the Rev. C. Parish, and are contained in "Science-Gossip," No. 92, of 1872. It would seem to matter little to the crab whether he burrows in stiff clay or loose sand, both which substances he equally contrives to mould into pellets or balls when excavating his burrow on the beach:—"As I was walking with a friend, some ten years ago, along the sandy shore of the Tenasserim coast, I was surprised to see in one place a large number of apparently rolled pebbles or stones extending along the beach for some distance, just above high-water mark. The reason for my surprise was that such a thing as a pebbly beach is nowhere met with (as far as my experience goes) on this coast. The entire coast-line of Tenasserim, from Amherst on the north to the Pakchan River on the south, consists of alternating bold granite bluffs, which jut out into the sea, and semicircular sandy bays, with here and there an extensive mud-flat and mangrove swamp at the mouths of creeks and rivers. It is very hard to find a stone anywhere on any of the sandy beaches. Granite boulders of various sizes are frequently met with on the sand, but that is all. The very unusual appearance, therefore, of a number of stones, resembling shingle, collected together in one place, surprised me. After my companion and I had amused ourselves with throwing about some of these stones, which were so hard as to have required a hammer to break them, we found that others (those nearest to the sea) were soft—of a firm cheesy consistency—so that the end of a walking-stick could be forced into or through them. This naturally increased our surprise; we therefore set ourselves to discover, if possible, the cause of this strange phenomenon. We were not long in doing this. The actual process of manufacture was witnessed. It may be stated here that the part of the coast spoken of is not far from the mouth of the Tavoy River, which expands into a broad estuary several miles across. This river carries down towards the sea a vast quantity of mud, the greater part of which is distributed along the coast-bottom to the south, owing to the direction of the river, which flows from north to south, the run of the coast-line being the same. At Mergui, also, only sixty miles to the south, another large river, the Tenasserim, pours down its quota of mud, and this also is confined near the coast by the islands of the Mergui Archipelago, which stretch from near the mouth of the Tavoy River on the north, to near Junk-Schung on the south. I have dredged the bottom at intervals between Tavoy and Mergui, and found it to be mud the whole way inside the islands. The consequence of this is, that although some of the reaches of sand on this part of the coast are very fine, the sand is, nevertheless, comparatively shallow, and



it fines off rapidly to seaward, until, a little way out, pure mud is reached. In some parts, at low water, a very thin layer of sand covers the mud below. This mud is exceedingly stiff, and of the colour of the well-known blue lias. To come now to the manufacture of these stones. The crabs, which abound on tropical seashores, were here, although too small to be worth catching for the pot, considerably larger than I had seen in similar situations elsewhere; and, as the tide was low, we saw numbers of them running about the wet sands, and, as we approached them, they would dive rapidly down into the small round holes which it is their habit to burrow for themselves. In making these holes the crabs (as is, no doubt, known to many) throw out the soil in small round pellets or balls. I had frequently noticed at Amherst the tiny round balls of sand strewed about the holes which the smaller crabs there make. When the ejected material is sand, these balls are, of course, at once dissolved at return of each tide. But here, as the sand was only in a superficial layer, and the crabs were larger, in making their holes they penetrated through the sand and reached the mud; consequently the material thrown up was stiff clay, and the balls were larger in proportion to the size of the workers. Looking at these balls of clay as the tide was turning to flood, we soon perceived how our stones were made. The ripple of an advancing wave would first roll two of the smaller balls into one, then another wave would do the same with two larger ones, until, by a repetition of this very simple process, rounded balls of various sizes were formed, and ultimately, as the tide advanced, flung up high and dry upon the sand, out of the farther reach of the waves. Here they lay and hardened, until, in form, in weight, and in general appearance, they resembled *bona-fide* water-worn fragments of blue lias. There was a long line of these stones on the sand just above high-water mark, and they must have been numbered by thousands."

An equally common crab, a species of *Gelasimus*, is mentioned by Dr. Mason. It especially affects tidal creeks and mud banks, and the males are provided with one huge claw, which they hold up as though threatening or beckoning to some one. They are very agile, and despite their defiant attitude, quickly disappear down a hole if an effort is made to catch them.

#### Family **Portunidæ**.

GONISOMA	HOPLITES, Wood-Mason.	Bay of Bengal.
"	CRUCIFERUM.	Akyab.
"	ORNATUM.	
"	sp.	Akyab.
NEPTUNUS	GLADIATOR.	
"	GRACILIMANUS.	
"	PELAGICUS.	
"	SANGUOLENTUS.	
"	sp.	
TRALAMITA	SQUAMIFERA.	
ACHELOUS	WHITEL.	

#### Family **Canceridæ**.

CANCER	STRIGATUS, Herbst.	
ZOZYMUS	ÆNEUS.	
EPHXANTHUS	FRONTALIS.	
OZIUS	RUGULOSUS, Stimpson.	Nicobars.
LYOTODIUS	SANGUINEUS.	
UTERGATIS	DILATATUS.	

#### Family **Eriphidæ**.

QUADRELLA	CORONATA.
ERIPHIA	LEVIMANA.

#### Family **Parthenopidæ**.

LAMBRUS	CARINATUS.
SCYLLA	SERRATA.

*Family Inachidæ.*

CHORINTS LONGISPINUS.

Sub-class *PODOSOMATA*.

This is an aberrant group without respiratory organs, the abdomen rudimentary and unsegmented. The thorax in four segments, each carrying a pair of many-jointed legs. Sexes distinct. They are marine spider-like animals, mostly parasitical, furnished with a rostrate head and four ocelli.

RHOPALORHYNCHUS KRÖYER, Wood-Mason.

Andamans.

This remarkable new generic form is described by its discoverer (J.A.S.B. 1873, Part II. p. 171), who dredged it in 25 fathoms off Port Blair, "at which depth the bottom was clothed with a dense tangle of filamentous algæ, so closely resembling the animal in point of colour and form, that the latter was with difficulty distinguishable."

## Class MYRIAPODA.

Head distinct. Thorax and abdomen not differentiated, but divided into segments. Two antennæ. Feet always more than eight pairs in the adult. No metamorphosis. The young have four segments and four legs, but at each successive moult their number is increased.

## Order CHILOGNATHA.

Body more or less cylindrical and chitinous or shelly. Two pairs of legs on each segment (*somite*), except the first five or six.

*Family Iulidæ.*

The Millipedes (*Iulus*) are very harmless and sluggish animals, feeding on decayed wood and vegetable substances, and when touched roll themselves into a flat coil. In moving, a series of undulations or waves passes along the whole line of legs in a very regular and pleasing manner. In the eyes of the ignorant these harmless animals are often confounded with the formidable members of the next order.

## Order CHILOPODA.

Body depressed, submembranous, one pair of legs on each segment. Two anterior pair of legs modified into foot-jaws, whereof the second pair is perforated for the discharge of a poisonous secretion. Animal feeders.

*Family Cermatiidæ.*

CERMATIA NOBILIS, Templeton.

Maulmain.

*Family Scolopendridæ.*

The Centipedes (*Scolopendra*) are active animals which harbour in cracks and under stones, for which their flattened form is well suited. They are eminently raptorial, and will seize any living creature they are capable of overpowering. The bite of their venomous jaws is very painful, and the larger species can inflict a severe wound on a tender skin by the grasp of their legs. Many species are phosphorescent. Dr. Mason observes, "A specimen now before me, that fell from the thatch-roof upon a lady's shoulder, measures nine inches in length, and one inch and a quarter in circumference," and adds, "A small centipede (*Scolopendra phosphorea*), which emits a strong phosphorescent light, is very common. It does not, however, appear to give out its light until it is wounded, or at least attacked, when the whole of the part that has been touched suddenly becomes a living blaze, in no way dependent on the respiration, as in the fire-flies. There is a small dark line down the back and indications of the joints of the body, but each lobe glows like a mass of phosphorus."

SCOLOPENDRA INERMIS, Newport.

Tenasserim.

## Class ARACHNIDA.

Head united with the thorax (*Cephalothorax*). Abdomen not segmented in the typical forms, and never provided with limbs. Legs never more than four pairs. No antennae. Eyes simple, generally more than two, and often of unequal size. Like *Crustacea* the *Arachnida* moult and possess the power of reproducing lost limbs. Sexes distinct.

## Order SCORPIOIDEA.

Abdomen indistinctly separated from the cephalothorax, and having a 'post abdomen' or tail of six joints, the terminal one of which bears a perforated claw communicating with a poison gland. The maxillary palpi longer than the feet and terminating in a didactyle claw or 'pincers,' with which animals are held whilst being pierced and killed by the caudal sting. The scorpions are viviparous, the very young being carried about on the mother's body.

## Order CHELIFERIDEA.

These Arachnoids, or False Scorpions as they are called, are minute and harmless creatures, armed with pincers like the scorpions, but devoid of jointed tail and sting.

## Order ACARIDEA.

Head, thorax, and abdomen united. Mouth either masticatory or suctorial.

This order embraces the *Mites*, both Marine, Freshwater, and Terrestrial, and their variety is astonishing. *Acarus domesticus* is the cheese mite. *Leptus autumnalis* the harvest-bug, which fixing on the skin, gives rise to intolerable itching. *Gamasus coleopterorum* is the mite, seen clustering round the legs of the common dung beetle, from which little pest the strong beetle is helplessly unable to free himself. *Atax* lives in the branchiae of bivalves, whilst *Demodex folliculorum* lives in the sebaceous follicles of man. *Sarcoptes scabiei* burrowing beneath the skin, causes the itch in man, and another mite causes the mange in dogs. The vegetable kingdom suffers too from the attacks of mites no less than the animal.

## Order ARANEIDEA.

This order embraces the spiders proper, possessing a distinctly separated abdomen, eight legs, with seven joints each. Eyes simple, four to eight (two in a Cuban species). A pair of poison fangs (palpi) and abdominal glands for the secretion of a glutinous substance and spinning apparatus for constructing thread for forming a snare or net. There is often extreme disparity in the size of males and females, the former being sometimes so minute as to be almost parasitic on the person of their huge spouse. The eggs are deposited in a silken cocoon, which in some species is carefully carried about by the female beneath her abdomen, and is most carefully guarded till the young spiders emerge. The young spiders 'moult' as they grow, but undergo no metamorphosis. A long treatise would be required to describe the various forms, habits, modes of life, dwellings, and the life history of these animals; but so far as regards Burmese species next to nothing is known. But some idea of their probable number may be formed from the fact that some 500 species inhabit the British Isles, with its far poorer insect fauna than an equal area within the tropics. Dr. Stoliczka makes the following remarks on spiders:—

"It is strange that not only dislike, but a real enmity and ill-feeling against Arachnoids, seems to have taken hold of men's minds. No doubt, the few species which secrete a poisonous fluid in special glands, and through its use occasionally become dangerous, are the source of all this ill-feeling which has been extended to the most useful animals. Harmless they certainly are on the whole, and as regards usefulness, scarcely surpassed by any other class of animals. They wholly live on insects and destroy a large number of those which often create great damage to either animal or vegetable life. Thus they are important agents in sustaining a proper balance in the economy of nature, and their usefulness actually increases, by their not being dangerous in such a way, as insects often are.

"These are, however, not the only reasons which entitle the ARACHNOIDEA to a fair share of attention on the part of every observer of nature. Their instinct is often higher developed, than we find it in insects. This instinct not only shows itself in the way in which they obtain their living, but also in the art of weaving, in which they may be said to have been the teachers of man. Actually, almost their whole life is nothing but a carrying out of clever arrangements, resulting from a certain amount of thought and deliberation. The beauties of colour, the curiosities of form, etc., which they exhibit, are equally remarkable and interesting. It is, therefore, only natural that some of our oldest classic writers have expressed their admiration of the works and talent, exhibited by Arachnoids, in the most inspiring language, and many a beautiful idea in the mythology of the Greeks and Romans is interwoven with their mode of life."

The above remarks of Dr. F. Stoliczka are very judicious and true; but my late esteemed friend has, I think, overlooked the main reason for the dislike entertained for these useful animals, and that is their predatory and sanguinary natures. The poet says:—

"Olimus accipitrem quia vivit semper in armis,  
Sed caret insidiis hominum quia mitis hirundo est,"

and the same feeling that led the Romans to hate the hawk, leads us to hate spiders, as we are so often witnesses of its cruel ferocity to the helpless victim, pouring out its last gasp in a subdued 'buzz,' before its captor finally buries his fangs in its body.

### *Family Epeiridæ.*

EPEIRA (ARGYOPES) MAMMILLARIS, Stoliczka. Burma.

This species, writes Stoliczka, may be considered as the eastern representative of *Epeira sericea*, which is found in Egypt, and almost through the whole of Northern and Western Africa; the former differs from the latter by a shorter thorax and the want of numerous bands on the feet; the abdomen is also not emargined in front, and the anterior lateral edges are not serrated, which they always appear to be in the African form.

NEPHILA CHRYSOGASTER, Walck.

Adult female 20·24 lines. Adult male 2·25 lines.

Either this, or a closely-allied spider, is common in Burma, where it forms a large snare with a yellow silk of considerable strength. The females are so enormously larger than the males that the latter were supposed to belong to a small species, which frequented the snares of the larger spider for the purpose of picking up a stray insect. From specimens, however, received from Dr. Collingwood from Labuan, and from Mr. Thwaites from Ceylon, the Rev. O. P. Cambridge was enabled to describe the previously undiscovered male (Proc. Zool. Soc. Lond. 1871, p. 621), adding the following interesting remarks:—"Perhaps few points of sexual dissimilarity are more curious than this extreme difference in size between the males and females of this genus, the male being scarcely (in the present instance) more than one-tenth of the length of the female; it seems to me fairly accounted for by an application of a branch of the principle of sexual selection. It is the well-known habit of the female in some *Epeirids* to endeavour to destroy or devour the male, and M. Vinson, in his work on the spiders of the Mauritius, speaks of this habit in reference to a species of this genus. M. Vinson gives a very graphic account of the agile way in which the diminutive male escapes from the ferocity of the female by gliding about and playing hide and seek over her body and along her gigantic limbs: in such a pursuit it is evident the chances of escape would be in favour of the smallest males, while the larger ones would fall early victims; thus gradually a diminutive race of males would be selected, until at last they would dwindle to the smallest possible size compatible with the exercise of their generative functions, in fact probably to the size we now see them, *i.e.* so small as to be a sort of parasite upon the female, and either beneath her notice, or too agile and too small for her to catch without great difficulty."

Such is the ferocity indeed of the female spider, that she has been known to seize and devour the male in the act of making his loving overtures to her; and after their brief union, nothing but flight and the utmost address on his part saves the male from being devoured by his heartless consort. This is an extreme instance of the economy of nature, though a partially similar practice of 'maricide' rules among the social hymenoptera.

### Family Mygalidæ.

Dr. Mason says, "A large, black, hairy spider, with tusks like a centipede, and very poisonous, is occasionally seen. The Karens call it the bear-spider. It is of the genus *Mygale*, famous for the questionable habit of devouring birds; but the natives say that it kills cobras and other large snakes, and eats their brains."

Cobracidal spiders have certainly no existence, but that large spiders can kill and suck the juices of small helpless birds or mammals I quite believe.

### Order PHALANGIDEA.

These animals differ from spiders in possessing neither poison glands nor spinning apparatus. Eyes two only. Many species are highly gregarious, congregating together in masses.

### Order PHRYNIDEA.

This order embraces two families: *Phrynidæ*, with a rounded abdomen and the maxillary palpi with a single claw; and *Thelyphonidæ*, with the abdomen terminating in a jointed setiform appendage, and the maxillary palpi didactylous or clawed. They are slender-legged, active creatures, and despite their somewhat repulsive appearance, quite harmless.

### Family Thelyphonidæ.

Stoliczka gives the following species in his paper in the J. As. Soc. Bengal, 1873, Part II. p. 126, and points out how nearly the range in India of *Thelyphonus* corresponds with that of the *Passalidæ*, and is confined to those portions of the country marked by a strong Malayan infusion.

THELYPHONUS SCABRINUS, Stol.	Sikkim. Assam. Khasi hills.
„ ASSAMENSIS, Stol.	Sikkim. Assam.
„ ANGUSTUS, Lucas.	Sikkim. Martaban. Pinang.
„ FORMOSUS, Butler.	Martaban.
„ INDIUS, Stol.	South India. Bengal. Johore.

### Order SOLIFUGIDEA.

Abdomen segmented, distinct from the cephalothorax, palpi filiform. Eyes two only. Mandibles large and powerful, but without a poison gland.

To this order belongs the repulsive *Galeodes*, a spider-like animal, covered with hair, which harbours under stones. These animals can be domesticated, and when caged will devour raw beef greedily, but they are too savage and repulsive to become general favourites.

### Order PENTASTOMIDEA.

This degraded order has but one genus, *Pentastoma*—a worm-like entozoic parasite, but in the larval stage possessing four legs. The sexes are distinct. The asexual young, analogous to the 'scolex' of the 'Cestoda,' is found in the lungs and livers of herbivorous mammals and reptiles, and the perfect adult becomes developed in the lungs and respiratory passages of carnivorous mammals and reptiles. The lungs of large snakes are commonly infested by these creatures, which firmly attach themselves by four cephalic hooks, which they bury in the tissues of their host, allowing their bodies to dangle in the respiratory cavity.

## ENTOMOLOGY.

DR. MASON thus prefaces his chapter on this subject: "With the exception of the beetles, Burma presents an untrodden field to the entomologist. A few insects have been collected, but none, with a solitary exception, have been described or noticed in any work to which I have access. Still they form by no means the least important portion of our natural productions. The lac insect, the blister fly, the honey bee and the silk moth are important for their utility; the green beetles, the fire-flies and the butterflies for their beauty; the white ants, the blights and the caterpillars for their predatory habits; and the gnats, the mosquitoes, the gad flies, the ticks, the bugs, the fleas, the scorpions and centipedes for their annoyance to man."

### Class INSECTA.

This great class, which embraces some of the loveliest forms of invertebrate life, is thus characterized. Wings generally present. Head, thorax, and abdomen distinct. Two antennæ. Three pairs of legs, neither more nor less, though the anterior ones may be rudimentary. Respiration by means of tracheæ, or tubes communicating with the surface by lateral openings (*stigmata*) or spiracles. Sexes distinct. Agamic reproduction (*Parthenogenesis*) occurs in some orders, and may be regarded as a process of cell development analogous to 'budding.'

### Order THYSANURA.

The most noteworthy member of this order is the common apterous Fish-insect (*Lepisma*), which harbours in and destroys our books, a soft active creature, covered with fine scales (which are beautiful objects under a microscope), and with a tail composed of three divergent setiform appendages.

### Order HEMIPTERA.

Four wings, more or less membranous. Mouth armed with a suctorial proboscis (*haustellum*). Larva wingless. One of the latest contributions to our knowledge of Burmese Hemiptera is a list by Mr. W. L. Distant, of Tenasserim species, published in the Journal of the Asiatic Society of Bengal for 1879, Part II. No. 1, p. 37. This list and the British Museum Catalogues have been mainly used in the present catalogue. The members of this order are both animal and vegetable feeders, some of the latter being of considerable commercial importance. The *Coccus cacti*, or cochineal insect of Mexico, is the best known, and in 1850, according to Balfour (Cyclopædia of India), 1122 tons were imported into England of the value of £440,000, and representing the astonishing number of 175,929,600,000 individuals, 70,000 of which, when dried, go to the pound. The red flowered 'cactus' (*Opuntia*), or prickly pear, seems best suited for the insect; but there are probably several species, of which the Mexican species is by far the most valuable as a dye producer, and which seems capable of being domesticated in India. The 'dye' is nothing more than the dried body of the female insect, detached, during life, from the plant to which it adheres parasitically, dipped in boiling water to kill it and dried in the sun.

Sub-order *PHYOPHTHIRIA*.

Mostly parasitic on trees and shrubs. The larvæ are often covered with flocculent cottony threads.

Family *Coccidæ*.*Coccus lacca*.

The lac insect is the most important member of this family. The male has two wings, and flies freely; but the female is apterous and parasitical (so to say) at all ages. The body is a mass of red-coloured paste, which is simply the lac dye of commerce, and from the sides of her body exudes a resin in such quantities as gradually to encase her in a sort of cell; this resin is the 'shell lac' of commerce. The crude lac, as brought to market, consists of the twigs whereon the resinous cells are attached, in which the female lac insects are contained. The whole mass is pounded up and steeped in water, which dissolves out the coloured matter formed of the insect's body. This is subsequently precipitated and formed into cakes, after which the refuse is heated, and the resin melted out. This process is conducted in canvas bags, which are subjected to pressure, and the pure resin as it exudes is scraped off in flakes, which are termed 'shell lac,' being faintly orange-tinged. Dr. Mason says, "The Karens think the lac is produced by an ant, and call it the lac ant." The insect is parasitical on several species of trees, as *Ficus religiosa* and other figs, *Butea frondosa*, *Zizyphus jujuba*, etc., and is sometimes so crowded on the stems that they are seen incrustated, as it were, with a pipe-like mass half an inch in diameter or more, made up of the closely-packed cells of the 'lac insect.' The finest 'lac' comes from Siam and the Shan states via Rangoon, and much is also collected in Assam and some parts of Bengal. In 1850-51, according to Balfour (*op. cit.*), 3757 tons of lac and lac dye were exported from Calcutta, and 1670 tons from Bombay, or in all 5427 tons in one year of this insect, worth over £200,000. Some species of this order secrete waxy filaments, and 'Manna' is said to be an exudation caused by the puncture of the *Coccus manniferus*.

Family *Aphididæ*.

Aphides are mostly viviparous in summer, and oviparous in winter, and in the former case the females are winged. Agamic reproduction (*Parthenogenesis*) may be carried on through many generations, a fact as singular as it is well ascertained. The members of this family constitute those familiar pests of the gardener, Plant lice, including the more formidable *Phylloxera*, which in some years has almost ruined the grape harvests in some parts of Europe.

The *Aphis*, or plant louse, exudes a nectarous or saccharine fluid, familiarly called honey-dew, and of which ants are particularly fond. Groups of ants may be often seen surrounding the *Aphides* and gently stroking them with their antennæ, to induce them to yield the coveted juice, which from time to time the *Aphis* does, by ejecting a pellucid drop from its anal siphuncle, which drop is at once consumed by the nearest ant with evident signs of gastronomic approval. Ants, too, are said to carry off some species of *Aphides* into their nests, where they are carefully tended, precisely as cows are by men, for the sake of their potable secretions. Van Beneden thus writes of these insects in his entertaining and popular work on animal parasites<sup>1</sup>:—"Who does not know those small green bodies, of the size of a pin's head, coming like a cloud upon the buds and leaves of the rose bushes, which shrivel and wither immediately? There are green ones on certain plants, and black ones on others; but whatever their colour, they are living pearls which form garlands round the stalk. . . . Let us examine with a magnifying lens these walking grains of sand, each grain will reveal to us a charming insect, whose head is adorned with two little antennæ, and has globular projecting eyes, glistening with the richest colours; behind these are two reservoirs of liquid sugar, elegantly mounted on a polished stalk and always full.

<sup>1</sup> Animal Parasites, International Scientific Series, Vol. XX. by P. J. Van Beneden.

. . . . Much has been written about these small sugar manufactories, so well known by ants, that they have procured for the 'Aphis' the name of the 'ant-cow.' The viviparous Aphis not only produces a mature insect at birth, but the new-born daughter is herself gravid with a similarly-matured and perfect offspring, an example of compound Parthenogenesis which is marvellous to contemplate. Viewed as some writers love to represent it, as a 'Teleological' arrangement, to prevent the exuberant development of the 'rose,' it seems a clumsy and not very loudly called-for contrivance, for the rose is not one of those noxious or pestilent plants, like some weeds, which overtax man's efforts to keep in check; but viewed as one of the varied and countless developments of creative energy, it affords us solid grounds of thankfulness that our place in nature is what it is, and enables us to contemplate, and realize (darkly it may be, and with wholesome limitations touching the ways of 'Madame Why') the grandeur, the magnificence, the beauty, alike of Nature's greatest and smallest works.

#### Family **Psyllidæ.**

Woolly blights are thus described by Dr. Mason:—"Some species which do not secrete honey-dew are of a large size, clothed with a white, cotton-like covering, and when disturbed they have the habit of leaping to a considerable distance. *PSYLLA*, sp."

#### Sub-order **HOMOPTERA.**

Tarsi three-jointed. Wings membranous, deflected. Proboscis inferior.

The females of the *Homoptera* are often furnished with an ovipositor, composed of a bivalve sheath, inclosing a cylindrical boring organ, whereby they are enabled to deposit their eggs at some distance from the surface of the ground. The *Cicadidæ* are remarkable for their loud and piercing song. This music is confined to the males, and is produced by a peculiar mechanism of membranous drums, with their appropriate muscles placed in a cavity at the base of the abdomen, and covered outwardly by the dilated sides of the metasternum.

#### Family **Ledridæ.**

LEDRA SCUTELLATA, Walk.	Burma.
„ CULOBIATA, Walk.	Burma.
EPICLINES PLANATA, Amyot et Serv.	Tenasserim.

#### Family **Tettigoniidæ.**

TETTIGONIA OBSCURA, Walk.	Burma.
„ FERRUGINEA, Fabr.	Tenasserim.

#### Family **Cercopidæ.**

PTYELUS CONIFER, Walk.	Burma.
------------------------	--------

*P. spumarius* is the common 'cuckoo spit,' the frothy fluid being the nidus wherein the insect is concealed.

CERCOPIS NIGRIPENNIS, Fabr.
„ SEPTEMPUNCTATA, Walk.

"Plant lice," says Dr. Mason, "are often very destructive to our gardens, especially to sickly plants. They are not usually, I think, the Aphidæ of Europe, but the Cercopidæ. The ants, however, manifest the same affection for them, and make like efforts to obtain their honey-dew. One species may be seen covered with a frothy secretion like the common 'frog-hopper,' *P. spumaria*."

COSMOCARTA MASONI, Dist.	Tenasserim.
„ MEGAMERA, Butler.	Tenasserim.
„ TRICOLOR, St. F. and Serv.	Tenasserim.



*Family* **Membracidæ.**

CENTROTUS REPTENS, Walker.	Tenasserim.
„ VARIUS, Walker.	Burma.
„ FLEXUOSUS, Fabr.	Tenasserim.
„ <i>anchorago</i> , Guér.	
CENTROTYPUS ASSAMENSIS, Fairm.	Tenasserim.

*Family* **Cicadellinidæ.**

SPHENORRHINA BRACONOIDES, Walker.	Burma.
-----------------------------------	--------

*Family* **Cicadellidæ.**

UROPHORA HARDWICKI, Gray.	
---------------------------	--

*Family* **Issidæ.**

EURYBRACHYS (?) PUNCTIFERA, Walk.	
ANCIYA APPENDICULATA, Westwood.	Martaban

*Family* **Ricaniidæ.**

RICANIA GUTTIGERA, Walk.	
--------------------------	--

*Family* **Flatidæ.**

CERYNIA MARIA, White, var.	
„ TENELLA, Walk.	
FLATA LIMBATA, Fabr. (white wax insect).	Burma.
„ TENELLA, Walker.	Burma.
„ INORNATA, Walker.	Tenasserim.
COLOBESTHES CONSPERSA, Walker.	Burma.
„ ALBIPLANA, Walker.	Burma.

*Family* **Fulgoridæ.**

DYCTIOPIORA LEPTORHINA, Walker.	Burma.
CIXIUS MEANDER, Walker.	Burma.
HEMISPHERIUS RUFOVARIUS, Walker.	Burma.

The following list of species of *Fulgora* is drawn up from Butler's list of the species of that genus in Proc. Zool. Soc. Lond. 1874, p. 97:

*a.* Wings orange (when dead).

FULGORA CANDELARIA, L.	Hong Kong.	Cambodia.
„ VIRIDIROSTRIS, Westw.	Assam.	
„ NIGRIROSTRIS, Walk.	Pachebone.	
„ SPINOLE, Westw.	Sillhet.	
„ LATHBURNI, Kirby.	Hong Kong.	

*b.* Wings white.

„ CLAVATA, Westw.	Sillhet.
-------------------	----------

The rostrum of this species has a ludicrous resemblance to a 'vesuvian' cigar light.

*c.* Wings blue-green.

„ DEUCALIS, Stål.	Cambodia.
„ CELESTINA, Stål.	Cambodia.

(Sub-genus *Pyrops*, rostrum much compressed.)

„ GEMMATA, Westw.	Darjiling.
-------------------	------------

*d.* Wings sub-hyaline, pale greenish.

„ VIRESCENS, Westw.	Cherra.
---------------------	---------

*Family Cicadidæ.*

DENDUBIA	IMMACULATA, Walker.	Tenasserim.
„	MANIFERA, L.	Tenasserim.
„	CRANIA, Walker.	Burma.
„	CINCTIMANUS, Walk.	
„	INTEMPERATA, Walker.	Tenasserim.
CICADA	GUTTULARIS, Walker.	Burma.

Of this class of insects Dr. Mason remarks:—"Those famous singers, the Cicadæ, celebrated by Homer, Virgil, and from the ancients down to the present time, are numerous both in individuals and species. One of the first objects that attracts the attention of an observer in some localities of the Karen jungles is, a clay tube several inches high, raised over a shaft sunk two or three feet in the ground, over which may be often seen a Karen, bending and inserting the extremity of a long branch of thorny rattan, which after a few twists is withdrawn, bringing with it a grub that is deemed a great luxury. The natives have a distinct name for this grub, and seem to be ignorant that it is the larva of the Cicada. This I was able to verify, on one occasion, by observing the exuvie of many of their pupæ adhering by claws to the serrated bark of trees, with rents in their backs, out of which the perfect insect had escaped. The Karens, it may be observed, are no more barbarous in their taste than the civilized Greek, for Aristotle testifies that they were an article of diet, both in their larval and perfect state, and one species is still eaten by the American Indians. A cicada, gilded with a bright yellow transverse band on its wings, is occasionally seen. The Karens say its call is *Kan-see, Kan-see*, and this is the name by which it is known to them. I was one evening serenaded by one, that poured out its vesper song from a jack tree before my door, in strains loud enough to have startled one unacquainted with the musician. Its sounds were full, shrill, and continuous, swelling up like an Æolian harp so as to fill all the air around.

"The instrument on which this gay minstrel performs is a unique piece of mechanism,—a perfect melodeon possessed only by the male, and which he carries about between his abdomen and hind legs. It consists of two pairs of plates composing a shield for the box concealed beneath. Under these plates is a delicate iridescent covering, tensely stretched over the cavity, like the head of a drum; and attached to its inner surface are several muscular strings, secured at their opposite extremities to another membrane at the posterior end of the box. The music is produced by the alternate contraction and expansion of these strings, which draw the tense concave covering downwards, with a rapid receding, the sounds issuing from two key-holes of the instrument, strikingly analogous to the action of the melodeon."

PLATYPLEURA	NOBILIS, Germ.	Tenasserim.
„	INSIGNIS, Dist.	Tenasserim.
CEPHALONYX	TERPSICHOE, Walker.	Burma.
HUECHYS	PHILEMATA, Amyot et Serv.	Burma.
„	SPLENDIDULA, Fabr.	Burma.
„	SANGUINEA, De Géer.	Tenasserim.
„	THORACIA, Dist.	Tenasserim.
SCIEROPTERA	SPLENDIDULA, Fab.	Tenasserim.
POMPHIX	TIGROIDES, Walker.	Tenasserim.
CRYPTOTYMPANA	RECTA, Walker.	Tenasserim.

Sub-order *HETEROPTERA.*

Tarsi three-jointed. Wings horizontal. Proboscis anterior.

To this sub-order belong the common bug (*Cimex lectularius*), the aquatic 'water-boatman' (*Notonecta glauca*), and the genus *Reduvius*, a bug capable of inflicting excruciating pain by the puncture of its proboscis, if rashly handled, the puncture of one species found in Hungary being occasionally said to terminate fatally. Dr. Mason writes:—"There are several species of the same tribe that furnishes the common bed-bug in the Provinces, with precisely the same disagreeable odour, but

much stronger. A single insect crossing the path will infect a stratum of air of several feet in width, which remains for a considerable period. A small black species sometimes comes on the table around the lights at evening, which is very disagreeable, though its scent is not so strong as some others. In smaller numbers a grey species is an occasional visitor.

"A large greenish species is very injurious to fruit. I have observed individuals repose for hours on the oranges that were nearly ripe, sucking their juices through the skin; and when the oranges were plucked, they had large scars on the places where the insects had rested, and the orange within was injured in those places.

"I examined a species in Tavoy which proved to belong to Westwood's *Tingidæ*. Rostrum three-jointed, tarsi three-jointed. Scutellum two-thirds the length of the insect. Two small thorns on each shoulder, with a small brass-coloured patch behind on the margin. Edge of the wing-cases with six black thorns on each side, six black spots on the abdomen, general colour of the insect deep green above and light green beneath.

"The Karens near Rangoon describe a similar insect as some years effecting much injury to the paddy by absorbing its juices, before the kernel has become hard. Whole fields of rice are sometimes abandoned in consequence of the devastation of the paddy-bug. The offensive odour which some of these insects emit appears to be done in self-defence. Some, the grey species especially, will come about the table and not the slightest disagreeable scent be discovered, but no sooner has one come in contact with it, than it emits an intolerable effluvium."

#### Family **Belostomidæ**.

"A large water insect, as denominated by the natives, resembling a gigantic cockroach, is not uncommon. The perfect insect has the tarsi two-jointed, but quite incorporated with the extremity of the tibiæ, and terminated by a long slender and acute unguis characteristic of the genus *Belostoma*. A specimen before me measures two inches and three-quarters in length. From some brief remarks on the Asiatic species of this genus by Dr. Leidy in the Journal of the Academy of Natural Sciences of Philadelphia, the Tenasserim species is, I judge, *B. indica*, St. F. and S."

#### Family **Gerridæ**.

"A long-legged insect may be frequently seen stalking haughtily about, on the surface of our inland streams, like a Burman king on the shoulders of his human horse. It has obtained the appropriate name of water-skipper. The Burmese call it the 'marine officer.' Gerris, sp."

*PTILOMERA LATICAUDA*, Hard.

#### Family **Nepidæ**.

*RANATRA GROSSA*, Fabr.

Tenasserim.

#### Family **Reduviidæ**.

*EUAGORAS PLAGIATUS*, Burm.

*VELINUS MALAYUS*, Stål.

*REDUVIUS MENDICUS*, Stål, var.

*VESBIUS SANGUINOSUS*, Stål.

To this family belongs the natural and appropriate enemy of the common bug, of which Van Beneden thus writes (*op. cit.* p. 267): "Happily for us, another hemipterous insect, the masked reduvius (*Reduvius personatus*), penetrates like the preceding one into our apartments, and covers itself with dust in order the more readily to fall upon its enemy; but man is not sufficiently acquainted with its habits to make war in common with it on this miserable parasite (the Bug). We ought for this purpose to place the masked *Reduvius* under the protection of the law, and offer premiums for the most vigorous races." Many people may often have noticed a repulsive-looking insect on trees, covered over with loose rubbish or filth. This

is a species of *Reduvius*, which, under concealment of a heap of loosely attached extraneous matters, makes his approach towards his unsuspecting prey.

*Family Tingidæ.*

ACANTHIA (CIMEX) LECTULARIA, the common bed-bug, belongs to this family.

*Family Aradidæ.*

BRACHYRHYNCHUS MEMBRANACEUS, Fabr.

*Family Acanthaspididæ.*

TIARODES VERSICOLOR, Lap.

SMINTHUS MARGINELLUS, Dist.

VELITRA RUBRO-PICTA, A. and S.

*Family Pyrrhocoridæ.*

LOHITA GRANDIS, Gray.

IPHITA LIMBATA, Stål.

PHYSOPELTA GUTTA, Burm.

ANTILOCUS RUSSUS, Stål.

„ COQUEBERTI, Fabr.

ODONTOPUS NIGRICORNIS, Stål.

DINDYMUS RUBIGINOSUS, Fabr.

DYDERCUS CINGULATUS, Fabr.

*Family Coreidæ.*

ACANTHOCORIS SCABRATOR, Fabr. Tenasserim.

MACROCHERAMA GRANDIS, Gray.

DYSDERCUS KÖENIGI, Fabr.

SERINETHA AUGUR.

PHYSOPELTA GUTTA, Burm.

*Family Homœoceridæ.*

HOMŒOCERUS JAVANICUS, Dallas. Tenasserim.

„ MARGINELLUS, H. S. Tenasserim.

*Family Anisoscelidæ.*

SERINETHA AUGUR, Fabr. Tenasserim.

„ ABDOMINALIS, Fabr. Tenasserim.

*Family Alydidæ.*

RIPTORTUS PEDESTRIIS, Fabr. Tenasserim.

*Family Edessidæ.*

ASPONGOPUS OBSCURUS, Fabr. Burma.

„ MARGINALIS, Dallas. Tenasserim.

„ NIGRIVENTRIS, Hope.

EUSTHENES.

CYCLOPELTA OBSCURA, St. F. and Serv. Tenasserim.

*Family Mictidæ.*

DALADER PLANIVENTRIS, Hope.

„ ACUTICOSTA, A. and S. Tenasserim.

MICTIS TENEBROSA, Fabr. Tenasserim.

„ GALLINA, Dallas. Tenasserim.

PHYSOMELUS CALCAR, Fabr. Tenasserim.

„ PARVULUS, Dallas. Tenasserim.

*Family* **Pentatomidæ.**

EUSARCORIS DUBIUS, Dallas.	
PENTATOMA LATIPES, Dallas.	Tenasserim.
„ CRUCIATA, Fabr.	Tenasserim.
„ PULCHRA, Dallas.	Burma.
ANTESTIA ANCHORA, Thunb.	Tenasserim.
PRIONACA LATA, Dallas.	Tenasserim.
STRACHIA CRUCIGERA, Hahn.	Tenasserim.
CAPACANTHUS INCARNATUS, Drury.	Tenasserim.
RHAPHIGASTER VARIPENNIS, Hope.	Tenasserim.

*Family* **Eurygastridæ.**

PODOPS OBSCURUS, Dallas.	Tenasserim.
--------------------------	-------------

*Family* **Plastaspidæ.**

BRACHYPLATYS SUBLENEA, Hope.	Tenasserim.
------------------------------	-------------

*Family* **Asopidæ.**

CANTHECONA PURCELLATA, Wolff.	Tenasserim.
ZICRONA CERULEA, L.	Tenasserim.

*Family* **Halydidæ.**

DALPADA CLAVATA, Fabr.	
„ OCUATA, Fabr.	
„ VARIA, Dallas.	Tenasserim.
AGLEUS TESSELLATUS, Dallas.	Burma.

*Family* **Pachycoridæ.**

CHRYSOCORIS GRANDIS, Thunb.	Tenasserim.
„ PORPHYRICOLUS, Walk.	Tenasserim.
HOPEA CURCULIONIDES, H. S.	Tenasserim.
CANTAO OCELLATUS, Thunb.	
SOLENOSTHEIDIUM RUBROPUNCTATUM, Guér.	
SCUTELLERA NOBILIS, Fabr.	Maulmain.
CALLIDEA STOLLII, Wolff.	Tenasserim.
„ DILATICOLLIS, Guér.	Maulmain.

Sub-order **THYSANOPTERA.**

The best-known representative is the destructive Turnip-fly (*Thrips*).

Sub-order **MALLOPHAGA.**

This order embraces the parasitic hemiptera whose development has been (as it were) arrested at an early stage. They are the lice which live on the skin, hair and feathers of mammals and birds, an example of which is the common louse.

Order **ORTHOPTERA.**

The Orthoptera are amongst the most highly organized insects. They have four wings—the anterior pair coriaceous or submembranous, the posterior membranous and folded. Jaws mandibulate. Many species are apterous, especially the females. The members of the curious Family *Mantidæ* are highly predatory and carnivorous; the *Blattidæ* are omnivorous, the rest of the order are herbivorous, and an invasion of locusts causes more destruction than a hostile army, or than any number of wild beasts.

Sub-order *CURSORIA*.

Body ovate, depressed. Head retracted into the prothorax. Legs slender. Tarsi with an accessory joint between the claws. The antennae usually long and slender. Females commonly, males occasionally, apterous.

Family **Blattidæ**.

To this order belongs the common cockroach of English kitchens (*Periplaneta*). The egg cases of members of this family are little oval capsular bodies, with one side serrated along a line, which opens to permit the young when hatched to escape. The ova are ranged in tiers within the capsule, which is affixed by the female in dry secluded spots to fixed bodies, as furniture or the like.

PANESTHIA FLAVIPENNIS, Wood-Mason.	Naga hills.
„ SAUSSURII, Wood-Mason	Sikkim.
(J. A. S. B. 1876, Part II. p. 190).	

Sub-order *GRESSORIA*.

Body long, narrow. Head exerted. Legs slender, and the posterior femora not thickened.

This sub-order embraces the carnivorous *Mantidæ* and the herbivorous *Phasmidæ*, commonly known respectively as the ‘walking leaf’ and ‘stick’ insects.

Family **Mantidæ**.

The anterior legs serrated, and used as prehensile organs, with the femora grooved for the reception of the tibiæ. The head very versatile. These insects are very watchful, and when intent on their prey, or suspicious of danger, often assume grotesque attitudes, and avail themselves of their mimetic forms to avoid observation.

PHYLLIUM CELEBICUM, De Haan.	Toungnoo.
„ WESTWOODII, Wood-Mason.	South Andamans. Palphoon.
	Malewoon.
HIERODULA (RHOMBODERA) BUTLERI,	Naga Hills.
Wood-Mason (P.Z.S.L. 1878, p. 580).	
ÆTHALOCROA ASHMOLEANA, Westw.	Calcutta.
HYMENOPUS BICORNIS, Stoll.	Assam. Java.

Family **Phasmidæ**.

These insects, even more than the Mantidæ, which possess superior powers of flight, rely on their resemblance to inanimate objects to avoid their enemies, and are adepts at mimicking the grass or sticks to which they cling, whence their name of ‘stick insects.’

MENAKA SCABRIUSCULA, Wood-Mason	Silhet. Assam. Naga hills.
(J. A. S. B. 1873, p. 55).	
BACILLUS HISPIDULUS, Wood-Mason (l.c. p. 47).	South Andaman.
„ OXYTENES, Wood-Mason (l.c. p. 48).	Pegu.
„ LEVIGATUS.	Naga hills.
„ ARTEMIS, Westw.	Sikkim. Assam.
„ INSIGNIS, Wood-Mason.	Assam. Sikkim. Cherra.
LONGHODES CUNICULUS, Westw.	
„ VERRUCIFER, Wood-Mason.	South Andamans.
„ WESTWOODI, Wood-Mason.	South Andamans.
„ STILINUS, Westw.	
„ AUSTENI, Wood-Mason.	Dikrang Valley. Assam.
„ CRAWANGENSIS, De Haan.	Martaban.
PHIBALOSOMA WESTWOODI.	Samaguting, Assam.
LOPAPHUS PORUS, Westw.	Upper Tenasserim.

LOPAPHUS BOOTANICUS, Westw.	Naga hills.
„ BAUCIS, Westw.	Sibsagar.
BACTERIA SHIVA, Westw.	Khasi hills.
NECROSCIA HILARIS, Westw.	Sikkim. Assam.
„ MENAKA, Wood-Mason.	Khasi hills.
„ SIPYLUS, Westw.	Burma.
„ MACULICOLLIS, Westw.	Burma.

Mr. Wood-Mason was the first to point out (J. A. S. B. 1875, Part II. p. 220) that the last dorsal abdominal segment in the males of this orthopterous family (except *Phyllium*) is modified to serve as a more or less efficient clasping apparatus. Frequently the whole segment is so profoundly modified as to constitute a regular forceps, whereby their brides may be held fast. These organs in *Lonchodes*, *Phibalosoma*, *Podacanthus*, etc., have been often figured, but their precise function and their relation to the sex of the insect had not before been assigned and interpreted.

#### Sub-order *SALTATORIA*.

Body generally slender. Hind-legs thickened and saltatorial.

##### *a. Antennæ long and setaceous.*

##### Family **Gryllidæ**.

This family embraces the Crickets (*Gryllus*), and that curious insect the Mole Cricket (*Gryllotalpa*), and in both this and the next family the ovipositor is often of great length, to enable the female safely to deposit her eggs in the ground at a safe distance from the surface.

GRYLLOTALPA VULGARIS, Geoffr.

GRYLLUS CONSIMILIS, Walker.

##### Family **Locustidæ**.

PHASNEROPTERA DIVERSA, Walk.

To this family too belongs *Schizodactylus*, a great cricket-like insect of a brown colour, which burrows in sandy soil, and is remarkable for its curled membranous wings.

##### *b. Antennæ short. Ovipositor none.*

##### Family **Acrididæ**.

PYRGOMORPHA CRENULATA, Fabr.

OPOMALA TENEBROSA, Walk.

PHYMATEUS MILIARIS, L.

CYRTACANTHACRIS FERRINA, Walk.

„ PUNCTIPENNIS, Walk.

ACRIDUM VIRESCENS, Walk.

„ ANGUSTIFRONS, Walk.

EPIEROMIA VULNERATA, De Haan.

„ VARIA, Walk.

MASTAX INNOTATA, Walker.

ICTRIX EXULTANS, Stål.

ONYA DIMINUTA, Walk.

CALOPTINUS INCOMPTUS, Walk.

„ INAMENUS, Walk.

#### Sub-order *EUPLEXOPTERA*.

Anal segment provided with a moveable forceps. This sub-order embraces one family—the *Forficulidæ* or earwigs.

## Order NEUROPTERA.

This is a somewhat heterogeneous order, embracing insects, displaying exceptions to all its leading characters, which may be summed up thus. Wings four, more or less equal, membranous, reticulate, and rarely folded. Jaws mandibulate. Pupa incomplete. Larva with six articulated legs.

## Sub-order ISOPTERA.

Antennæ short, many-jointed. Wings large, equal, deciduous.

## Family Termitidæ.

Termites or '*white ants*' are social Neuroptera, and are undoubtedly the greatest pests of any insects within the tropics. They are subterranean and nocturnal in their habits, and their industry is matchless. They present points of resemblance and dissimilarity to Bees, swarming like them and having the majority of the community made up of neuters, or sexually imperfect females, but differing from them in the (asserted) presence of more than one queen in the community. The males and females are fully winged—and they alone issue in dense swarms from the nest to found new colonies. This swarming takes place in humid weather, generally, but not always, towards evening, and the perfect insects at such times may be seen rising into the air like a steadily ascending column of smoke. The fact is soon made known by the activity of all birds in the neighbourhood, and even such large birds as Kites do not disdain to hawk at the fluttering termites in the air, whilst many small quadrupeds and reptiles in the neighbourhood are on the look-out for such as fall to the earth. These countless thousands are all males and females bent on their nuptial tour, and the pairing once over, the female never again quits the abode she selects, but devotes herself solely to replenishing the race, a single female producing, it is said, 80,000 eggs in twenty-four hours.

The bulk of the community is composed of the so-called '*neuters*,' and these are of two sorts, the common '*labourer*' and the '*soldier*,' which last is provided with an enormous head and formidable pincers. The courage and tenacity of these little creatures is remarkable, and they will rather be torn in half than relax their grip of their opponent's flesh or body. Dr. Mason makes the following remarks on them:—

"The traveller in British Burma is frequently treading over mines of white ants or termites, as they have colonized almost every part of the provinces; but their depredations are perhaps not as incessant as might be anticipated from their bad reputation of being 'the most absolute pests of mankind.' My study-table stood for several years within a few inches of a post tenanted by myriads, yet they never disturbed it. Occasionally I made a small incision in the post, when, on listening, I could immediately hear a thousand little taps within—the battle-roll of sentinels beating to arms, and almost instantaneously, whole regiments would appear with enormous sickle-shaped jaws to defend their fortress. They do not usually, however, remain thus pacific, and unless the timber be impervious, they tunnel their way from room to room, from basement to attic, devouring chests of apparel, linen, books, or whatever impedes their course. On their foraging expeditions they frequently attach themselves to the exterior of a post, and arch their pathway up to the roof, the destruction of which they silently and speedily effect.

"The architectural labours of these social insects display great artistic beauty and variety. A metropolis of theirs was exhumed near my residence in Maulmain, the exterior of which appeared only like a large mound, not more than six feet high, but more than forty feet in circumference, with here and there a small circular vestibule visible through the turf-covered bastions, or a low spiral turret protruding above the oval vault. Within were thousands of edifices with multiform compartments, surrounded and connected by labyrinths, domes, and portals; while beneath, curious stair-cases led down long winding corridors, through innumerable multilocular caverns—the whole series presenting the aspect of continuous stories



one above the other, like city piled on city. Leading from this subterranean town in almost every direction were hunting paths, arched and tunnelled, extending across the road, and to distant parts of the compound."

The noise made by the jaws of these creatures can be often heard during the stillness of the night, in one's tent when encamped in the forest, and till its origin is known is rather puzzling. It is produced apparently by numbers of these creatures simultaneously gnawing or tearing with their mandibles, and ceases if the traveller gets a light to ascertain what can be making this noise in the ground within his very tent, but recommences as soon as his head is again laid on the pillow. The best protection for timber against the ravages of white ants is using seasoned wood, charring its surface and pouring round it coal tar or gas refuse, or watering the ground with a saturated solution of sulphate of copper. It would be worth while, in the case of public buildings, importing gas refuse for this purpose from Europe, when not procurable on the spot.

TERMES MAURITIANUS, Ramb.	Burma.
„ TAPROBANES, Walker.	Burma.
„ FATALIS, L.	

#### Sub-order *AGNATHI*.

Jaws membranous or obsolete. Posterior wings small or wanting. Abdomen ending in two or three long setæ.

#### Family *Ephemeridæ*.

The 'May fly' is a representative of this family. These insects lie for two or three years in a larval condition, and the perfect insect then issues in countless numbers, and always in the evening. The perfect insect takes no food, and lives only a day or two.

#### Sub-order *ODONATA*.

Wings sub-equal, reticulate. Jaws strong. The eyes very large and complex. The larvæ and pupæ are aquatic, and the insects are in all their stages highly predatory and voracious, and a terror to the insect world.

#### Family *Agrionidæ*.

LIBELLAGO BLANDEN, Walk.	Nicobars.
--------------------------	-----------

#### Family *Libellulidæ*.

Speaking of the Dragon-fly, Dr. Mason says, "This is one of the few insects which the Karens recognize in its larval state, and they often point out the larva in the water, which bears a distant resemblance to the perfect insect, but the body is shorter and thicker, and their wings are only rudimentary."

MATRONA BASILARIS, De Selys.
NEUROBASIS CHINENSIS, L.
NEUROTHEMIS SOPHRONTA, Drury.
„ EQUESTRIS, Fabr.
VESTALIS GRACILIS, Rambur.
BRACHYBASIS COROMANDELIANA, Fabr.
LEDES NODALIS, De Selys.
LEPTHEMIS SABINA, Drury.
LIBELLULA DALEI, De Selys.
PANTALA FLAVESCENS.
RHYOTHEMIS VARIEGATA, L.
RHINOCYPHA CUNEATA, De Selys.
PALPOPLEURA SEXMACULATA, Fabr.
MXAIS ANDERSONI, McLachlan.

Sub-order *PLANIPENNIA*.

Wings nearly equal. Antennæ long, many-jointed. Jaws distinct. The larvæ are voracious insect feeders, but the perfect insects are mostly herbivorous.

Family **Hemerobidæ**.

OSMYLUS CONSPERSUS, Walker.	Burma.
„ TUBERCULATUS, Walker.	Burma.

Family **Myrmeleonidæ**.

MYRMELEON INCLUSUS, Walker.	Burma.
„ LENTUS, Walker.	Burma.
„ TACHUS, Walker.	Burma.

The habits of the ‘*ant lion*,’ which is the larval form of *Myrmeleon*, are too well known to need recapitulation here. They are common in Burma in suitable localities, and are well deserving of more attention than is usually paid them.

Family **Panorpidæ**.

BITTACUS INDICUS, Walker.	Burma.
---------------------------	--------

Sub-order *TRICHOPTERA*.

Wings four, membranous, the anterior generally hairy. Mandibles rudimentary. The larvæ are six-footed and aquatic, and construct cases wherein they reside, of various available materials, sticks, stones or shells. In these ‘*caddis*,’ cases the pupa stage is assumed. Some Indian species of probably this order very closely simulate spiral shells, and exactly resemble a small ‘*Phorus*.’

STENOPSYCHE GRISEIPENNIS, McLachlan.

Order **DIPTERA**.

Wings two, membranous, never folded. A suctorial proboscis (*haustellum*). Metamorphosis complete. Larvæ apodal. The mouth in this order is often armed with lancet-like organs, with which the cuticle of animals is pierced for the purpose of suction. Their bite in consequence is often severe, but none of them are provided with a sting. The feet are two-clawed, and provided with adhesive cushions as well, whereby they are able to walk on the smoothest surfaces. In the larval state (maggots) they are of use, by consuming filth and decaying animal matter, but some species are injurious to crops (*Cecidomyia destructor* attacking wheat) and tormenting to man, especially certain minute species, by their bites and persistent attacks. Their fecundity is very great, and agamic reproduction sometimes takes place in this order, as the larvæ of *Miastor metrolous* are found to contain other larvæ identical, save in size, with themselves, and these larvæ produce successive generations of larvæ which ultimately develop into perfect insects.

Sub-order *PUPIPARA*.

Parasitic *Diptera*. The larvæ and pupæ developed within the body of the mother. Antennæ within a cavity in the head. This sub-order embraces three families: *Brandidae* or Bee lice, *Nycteribiidae*, spider-like parasites on bats, and *Hippoboscidae*, including ‘*Bots*,’ which are the larvæ of the “forest Fly.”

Sub-order *BRACHYCERA*.

Oviparous. Antennæ short.

The number of pieces composing the *haustellum* varies from two to six, and this character has been used in arranging the families into *Hexacheta*, *Tetracheta*, and *Dicheta*.

*Heracheta.*

Family **Tabanidæ.**

This family embraces the Gad flies.

*Tetracheta.*

Family **Asilidæ.**

Of this family, species of *Dasygogon*, *Nasa*, and *Laphria* have been recorded from Burma. Asilus is the fly which Virgil describes as terrifying cattle in Italy, and to escape which he recommends pasturing the herds in the early morning and in the evening only—

“Est lucos Silari circa, ilicibusque virentem  
Plurimus Alburnum volitans, cui nomen *Asilo*  
Romanum est (Œstrum Graii vertere vocantes),  
Asper, acerba sonans; quo tota exterrita silvis  
Diffugiunt armenta; furit mugitibus aether  
Concussus, silvaeque et sicci ripa Tanagri.  
Hunc quoque (nam mediis fervoribus acrior instat)  
Arcobis gravido pecori, armentaque pascas  
Sole recens orto, aut noctem ducentibus astris.”

The description applies also to the alarm caused to horses, cattle, and ruminants in general by various *Œstridæ*.

Family **Bombyliidæ.**

ANTHRAX SEMISCITA.  
TRICHOPTHALMIA, sp.  
DISCOCEPHALA, sp.

Family **Syrphidæ.**

ERISTALIS ANDREMON, Walk.  
,, AMPHICRATES, Walk.

*Dichete.*

Family **Muscidæ.**

TACHINA FUSIFORMIS, Walk.

Sub-order **NEMOCERA.**

To this sub-order belong the harmless ‘Daddy Long Legs’ (*Tipula*) and the gnats and mosquitoes (*Culex*, *Simulium*, etc.) which are as troublesome in Norway or Canada, as in the tropics, each zone of the earth seeming to be abundantly provided with its own appropriate pests. Of mosquitoes, Dr. Mason writes: “We have at least two species, one of which is banded with white stripes, and is more voracious than the other; as soon as it begins to taste blood, the hand may be brought slowly upon it, and it chooses death rather than flight.

“The larvæ of gnats and mosquitoes may be always seen in water that has stood for a few days, where they are readily discovered by their active motions, often diving and rising again to the surface. To avoid taking these insects in drinking, and thus destroying animal life, the Burmese priests strain their water, like the Pharisees of old, and it was these gnats in the larval state to which the Saviour referred, and not the gnat, properly so called, as the word is often rendered.”

People who keep orchid houses are much troubled by the quantities of mosquitoes which breed in the pans of water placed to maintain by their evaporation the humidity of the atmosphere. This annoyance may be cured by placing a

handful of salt in each pan, which does not interfere with the desired evaporation, but renders the water or brine unfit for the development of the larvæ. If, too, all bath rooms about a house had the water tubs and pans emptied every day, the mosquito plague would be greatly reduced, as no stagnant water, no mosquitoes.

### Family Tipulidæ.

*PTEROCOSMUS VELUTINUS*, Walk.

### Family Cecidomyiidæ.

To this family belongs the '*Hessian Fly*,' so destructive to wheat.

### Family Culicidæ.

Sub-order *APHANIPTERA*.

This is an aberrant group embracing a single family, *Pulicidæ*, to which the common flea belongs (*Pulex irritans*).

### Order LEPIDOPTERA.

Dr. Mason thus prefaced the subject of Butterflies, of which, however, his original list was meagre in the extreme:—"When a person dies, the Burmese say, the soul or sentient principle leaves the body in the form of a butterfly. This too was the faith of the Greeks, more than two thousand years ago. Among the ancients, when a man expired, a butterfly appeared fluttering above as if rising from the mouth of the deceased. The coincidence is the more remarkable the closer it is examined. The '*Psyche*' or soul of the Greeks represented by the butterfly, was the Life, the perceptive principle, and not the Pneuma or spiritual nature. So the Burmans regard the butterfly in man, as that principle of his nature which perceives, but not that of which moral actions are predicated. If a person is startled or frightened so as to be astounded for the moment, they say, '*His butterfly has departed*.' When a person is unconscious of all that is passing around him in sleep, the butterfly is supposed to be absent; but on its return the person awakes, and what the butterfly has seen in its wanderings constitutes dreams.

"The Greeks and the Burmese undoubtedly derived these ideas from a common origin. In the Buddhist legends of the creation of man, which originated in Central Asia, it is stated that when man was formed, a caterpillar or worm was introduced into the body, which, after remaining ten lunar months, brought forth the living man, and hence the reason why a butterfly is supposed to leave the body at death. Thus the caterpillar or larva state, the pupa or chrysalis, and the imago or perfect insect, are, to the Buddhist, representatives of man in his origin from the earth, in his subsequent conception in the womb, and in his perfect state as a sentient being, while the successive changes typify his endless transmigrations. This is a wonderful land for butterflies. Birds of passage are common in most countries, but butterflies of passage are nowhere on record. Yet such are sometimes seen in Burma. Westwood says, 'Various species of butterflies are remarkable for their periodical or irregular appearance; of these, the species of *Colias* or 'clouded yellows' are pre-eminent.' It is remarkable that butterflies of this same tribe of 'yellows' often appear in clouds in Burma and pass over the country in flocks, like the pigeons that annually migrate over Kentucky and other Western States of America."

In these days, when the value of the economic study of insects is fully recognized, and the elevating character of the study of even the humblest branches of Zoology not less so, it is curious to call to mind the change of feeling in this respect which a century has wrought. All Englishmen will remember the ridiculous light in which the florist and entomologist are depicted in the '*Dunciad*': as representatives of naturalists in general; but the feeling was that of the age rather than of the Twickenham satirist personally, and is equally displayed by a contemporary poet,

Vincent Bourne, in his lines on butterfly collecting, which are so good as to deserve to be better known than they are:

“Ut genera et species dignoseat papilionum,  
 Sitque quibus maculis quisque, quibusque notis;  
 Quotquot agris volitant, studiose hinc colligit illine,  
 Musei ut servet Fulvius inter opes.  
 Thesaurum egregium! si quis foret usus habendi;  
 At cuiam hæc servit cura laborque bono!  
 Papilio, centum quamvis servatur in annos,  
 Nil nisi reliquæ papilionis erit.”

Since Dr. Mason wrote, a vast stride has been made in the study of the insects of Burma, though I think it may safely be asserted of insects as a class, that (excepting the more showy Lepidoptera) far more remain to be discovered than have hitherto been enumerated from that area. Of the Lepidoptera a good many have been collected, but even of these not 10 per cent. have been studied in their metamorphoses, and the life of the individual traced from ovum to imago.

The present list of Lepidoptera is mainly based on the following data:—Catalogues of the British Museum; Catalogue of Lepidopterous Insects in the Museum of the East India Company, by Thomas Horsfield and Frederic Moore; Catalogue of the Lepidopterous Insects of Bengal, by Frederic Moore, P. Z. S. L. 1865, p. 755, and P. Z. S. L. 1867, pp. 44 and 612; The Lepidopterous Fauna of the Andamans and Nicobar Islands, by F. Moore, P. Z. S. L. 1877, p. 580; A List of the Lepidopterous Insects from Upper Tenasserim, by Frederic Moore, P. Z. S. L. 1878, p. 824; List of the diurnal Lepidoptera from Port Blair, etc., by G. J. Wood-Mason and L. de Nicéville, Journal As. Soc. Bengal, 1880, Part II. p. 223; other papers by Messrs. Moore, Westwood, and Butler in P. Z. S. L.; and last, but not least in value, a List of Sikkim Lepidoptera, by Lionel de Nicéville, in the Journal of the Asiatic Soc. of Bengal, 1881, Part II. No. 1, p. 49, wherein some attention is paid to the altitudinal range of a species instead of affixing the never-to-be-too-much-reprobated habitat ‘*Darjiling*,’ with its altitudinal range of 8000 feet, and consequently varied floral and insect zones.

As the compiler has no acquaintance with the profuse literature of the subject, he claims the indulgence of his readers for the numerous errors of nomenclature and arrangement which must have inevitably crept in. The reason, too, why the Lepidopterous insects of Bengal have been incorporated in the Burmese fauna is as follows. Of the species actually captured in Burma we have but a meagre list; but we may safely conclude that insects, which range from Northern Bengal to Ceylon or Java, will certainly be found in Burma likewise. This will enable us to include a large number not actually recorded as captured as yet within the Province. Another considerable number may be included, which, though they may not range to Java or Ceylon, may yet be confidently expected to range from Bengal into Arakan, and thus fall legitimately within the scope of the Burma fauna. A small residue of the insects of Bengal may perhaps not range into our Province; as their *not doing so* rests of course on the negative evidence of their *not being known* to do so, I think I act more safely in adopting the entire list, with the above proviso, than by limiting the selection of Burmese insects to those few only, of which actually *Burma-captured* specimens are known to exist.

The list of the Lepidoptera of Bengal was mainly drawn up from collections made by A. E. Russell, Esq., B.C.S., W. S. Atkinson, Esq., Director of Public Instruction, A. Grote, Esq., B.C.S., and Capt. J. L. Sherwill, and the geographical range embraced by these collections may be collectively described as reaching from Nipal to Assam and the Naga hills. The list of Lepidoptera from the Andamans is mainly based on a collection made by F. A. de Roepstorff, Esq., near Port Blair, and of the Nicobar insects from a collection made by R. Meldola, Esq.

Lepidoptera are characterized by four extended wings, scaly on both sides, and supported by a framework of branching ribs. The mouth is suctorial, the proboscis being curled up like a watch-spring whilst at rest, but capable of being



*Family Gelichidæ.*

DEPRESSARIA RICINI, Atkinson.	Calcutta.
„ ZIZYPHI, Atkinson.	Calcutta.
„ RICINELLA, Atkinson.	Calcutta.
GELECHIA HIBISCI, Atkinson.	Calcutta.
„ PUBESCINTELLA, Stainton.	Calcutta.
„ SIMPLICIELLA, Stainton.	Calcutta.
PARASIA APICIPUNCTELLA, Stainton.	Calcutta.
ANARSIA CANDIDA, Stainton.	Calcutta.
ŒCOPHORA SUBGANOMELLA, Stainton.	Calcutta.
BUTALIS TRIOCCELLATA, Stainton.	Calcutta.
BINSITTA NIVIFERANA, Walker.	Andamans. Bengal. S. India. Burma.
BLABOPHANES INSULARIS, Feld.	Nicobars.
SYME ORBICULARIS, Feld.	Nicobars.
THUSIZIMA CERATELLA, Walker.	
CERVARIA XYLINELLA, Walker.	Burma.

*Family Hyponomeutidæ.*

ATTEVA NIVEIGUTTA, Walk.	Bengal.
<i>Corinea niveiguttella</i> , Walk.	

The larva feeds on *Ailanthus excellens*, residing in a common very fine web.  
A perfect pest at times (Dr. Bonavia).

HYPONOMEUTA LINEATONOTELLA, Moore.	Darjiling.
------------------------------------	------------

*Family Plutellidæ.*

CEROSTOMA RUGOSELLA, Stainton.	Calcutta.
„ ALBOFASCIELLA, Stainton.	Calcutta.

*Family Tineidæ.*

TINEA LONGICORNIS, Stainton.	Calcutta.
PORSICA INGENS, Walk.	Bengal.
ALAVONA BARBARELLA, Walk.	Bengal.

## Tribe TORTRICES.

*Family Nycteolidæ.*

HYLOPHILA FALCATA, Walk.	Darjiling.
„ CHLOROLEUCA, Walk.	Darjiling.
TYANA CALLICHLORA, Walk.	Darjiling.
„ SUPERRA, Moore.	Darjiling.
APHUSIA SPEIPLANA, Walk.	Bengal.
<i>Micra partita</i> , Walk.	

*Family Tortricidæ.*

CERACE STIPATANA, Walk.	Bengal.
„ ONUSTANA, Walk.	Silhet. Darjiling.
ÆMENE TAPROBANIS, Walk.	Calcutta.
PANDEMIS EDUCTANA, Walker.	Burma.
DICHELIA PRIVATANA, Walker.	Burma.
CONCHYLIS FLAVICOSTANA, Walker.	Burma.
GRAPHOLITHA NOVARANA, Feld.	Nicobars.
CHOREUTES NOVARÆ, Feld.	Nicobars.

## Tribe PYRALES.

Family **Botydæ.**

ASTURA PUNCTIFERALIS, Guen.	Bengal.
<i>Botys eraxalis</i> , Walk.	
BOTYODES ASIATIS, Guen.	Bengal.
"    FLAVIBASALIS, Moore.	Bengal.
BOTYS SCINISALIS, Walk.	Andamans. Bengal. S. India.
" <i>disjunctalis</i> .	
"    ILLISALIS, Walk.	Andamans. Darjiling. Ceylon.
"    UNITALIS, Guen.	
" <i>megapteralis</i> , Walk.	Tenasserim. Bengal.
"    MULTILINEALIS, Guen.	Andamans. Bengal. Ceylon.
<i>Zebonia salomealis</i> , Walk.	
<i>Botys annuligeralis</i> , Walk.	
"    DAMOALIS, Walk.	Bengal.
"    AMYNTUSALIS, Walk.	Darjiling.
"    DAMOALIS, Walk.	Bengal.
"    AMYNTUSALIS, Walk.	Darjiling.
"    INCISALIS, Walk.	Darjiling.
"    PLAGALIS, Moore.	Darjiling.
"    INCOLORALIS, Guen.	Silhet.
"    MACCALIS, Lederer.	Silhet.
"    ZEALIS, Guen.	Silhet.
"    TULLALIS, Walk.	Silhet.
"    CALETORALIS, Walk.	Silhet.
"    PATULALIS, Walk.	Darjiling.
"    SUBTESSALIS, Walk.	Darjiling.
"    CONCATENALIS, Walk.	Darjiling.
"    JOPASALIS, Walk.	Tenasserim. Bengal. Ceylon.
"    CALDUSALIS, Walk.	Tenasserim. Sikkin.
"    VINACEALIS, Moore.	Tenasserim. Andamans.
"    ARDEALIS, Feld.	Nicobars.
"    STULTALIS, Walk.	Andamans. Ceylon.
"    THOASALIS, Walk.	Andamans. Bengal.
"    ABSTRUSALIS, Walk.	Andamans. Java. Ceylon.
"    OPALINALIS, Moore.	Andamans.
"    IMMUNDALIS, Walk.	Andamans. Java.
"    ASIATIS, Guen.	Burma.
" <i>sellalis</i> , Guen.	
"    EURYCLEALIS, Walk.	Burma.
"    CLYCESALIS, Walk.	Burma.
DYSALLACTA NEGATALIS, Walk.	Darjiling.
<i>Botys monesusalis</i> , Walk.	
" <i>phanasalis</i> , Walk.	
SCOPULA MARTINALIS, Walk.	Burma.
EBULEA OMPHELTESALIS, Walk.	Burma.

Family **Margaroniidæ.**

GLYPHODES DIURNALIS, Guen.	Darjiling.
"    CESALIS, Walk.	Darjiling. Burma. Andamans.
"    BIVITRALIS, Guen.	Tenasserim. Calcutta.
"    STOLALIS, Guen.	Tenasserim. Darjiling.
"    ACTORIONALIS, Walk.	Andamans. Darjiling.
"    MARGINALIS, Moore.	Andamans.
"    LUCIFERALIS, Walk.	Darjiling.
"    LACTSTRALIS, Moore.	Bengal.



GLYPHODES VAGALIS, Walk.	Darjiling.
„ GASTRALIS, Walk.	Darjiling.
MARUCA AQUATILIS, Walk.	Bengal.
SYNCLERA TRADUCALIS, Zeller.	Bengal.
„ <i>retinalis</i> , Leder.	
<i>Glyphodes univocalis</i> , Walk.	
PHAKILLURA INDICA, Saunders.	Bengal. Burma.
„ <i>gazoralis</i> , Guen.	
„ TRANSLUCIDALIS, Guen.	Silhet.
„ SUPERALIS, Guen.	Silhet.
CYDALIMA LATICOSTALIS, Guen.	Silhet. Andamans.
„ COCHYALIS, Guen.	Tenasserim. Calcutta. S. India.
The larva feeds on <i>Echites antidiysenterica</i> (Grote).	
RHODONEURA RETICULARIS, Moore.	Andamans.
„ TETRAONALIS, Moore.	Andamans.
„ MARMOREALIS, Moore.	Andamans.
PYGOSPILA TYRESALIS, Guen.	Burma.
PACHYARCHES AMPHITRITALIS, Guen.	Silhet.
„ PSITTACALIS, Hübn.	Bengal.
„ POMONALIS, Guen.	Bengal.
„ VERTUMNALIS, Guen.	Tenasserim. Bengal. S. India.
„ MARTHESIALIS, Walker.	Tenasserim. Darjiling. S. India.
„ MALIFERALIS, Walker.	Andamans. Bengal.
„ TIBIALIS, Moore.	Andamans. Bengal.
SISYROPHORA PILEIFERRE, Lederer.	Tenasserim. Darjiling.
EGLYPHIS PROCOPIALIS, Cham.	Tenasserim. Bengal. Java.
AUXOMITIA MIRIFICALIS, Lederer.	Nicobars. Bengal.
MARGARONIA TRANSVISALIS, Walk.	Darjiling.
HETERODUS CINEREALIS, Moore.	Darjiling.
FILODES FULVIDORSALIS, Geyer.	Bengal.
„ NIGROLINEALIS, Moore.	Bengal.
„ OCTOMACULARIS, Moore.	Darjiling.

*Family Spilomedidæ.*

LEPTYRODES GEOMETRALIS, Guen.	Bengal.
„ LEPIDALIS, Walk.	Bengal.
„ PERSPICUALIS, Walk.	Darjiling.
PHALANGODES NEPTALIS, Hübn.	Burma.
ZEBRONIA JAGUARALIS, Guen.	Darjiling.
„ ABRAXALIS, Walk.	Darjiling.
„ ZEBRALIS, Moore.	Darjiling.
„ VIREGATALIS, Moore.	Bengal.
„ AUROLINEALIS, Walk.	Darjiling.
„ PLUTUSALIS, Walk.	Darjiling. Bengal. Tenasserim.
„ DISTRIGALIS, Walk.	Bengal.
„ DISCERPTALIS, Walk.	Bengal.
„ LACTIFERIALIS, Walk.	Burma.
„ ABDICALIS, Walk.	Burma.
„ MINEUSALIS, Walk.	Burma.

*Family Hydrocampidæ.*

OLIGOSTIGMA CRASSICORNALIS, Guen.	Bengal.
„ SEX-PUNCTALIS, Moore.	Andamans.
„ PARVALIS, Moore.	Andamans.
HERDONIA OSACESALIS, Moore.	Darjiling. Silhet.

HYDROCAMPA FULCHRALIS, Moore.	Darjiling.
AGASTIA HYBLEODES, Moore.	Darjiling.
„ FLAVOMACULATA, Moore.	Darjiling.

*Family Asopidæ.*

CHNAURA OCTAVIALIS, Walk.	Darjiling.
SAMEA GRATIOSALIS, Walk.	Darjiling.
„ CUTRINALIS, Moore.	Andamans.
„ PURPURASCENS, Moore.	Andamans.
ASOPTA LIMBOLALIS, Moore.	Andamans.
LEUCINODES ORBONALIS, Guen.	Andamans.
TERASTIA DIVERSALIS, Walk.	Darjiling.
COPTOBASIS ANDAMANALIS, Moore.	Andamans.
„ LUNALIS, Guen.	Andamans.
<i>Botys thyasalis</i> , Walk.	
„ CUTREALIS, Moore.	Andamans.
PHYSEMATIA CONCORDALIS, Lederer.	Nicobars.
DICHOCHROSIS FRENATALIS, Lederer.	Nicobars.
AGATHODES OSTENTALIS, Walk.	Burma.
DARABA VITELLIALIS, Walk.	Burma.
HYMENIA RECURVALIS, Fabr.	Burma.

*Family Eunyichidæ.*

PYRAUSTA SILHETALIS, Guen.	Silhet.
„ ABSISTALIS, Walk.	Burma.
RHODARIA CONCATENALIS, Walk.	Darjiling.

*Family Pyralidæ.*

PYRALIS LUCILIALIS, Walk.	Darjiling.
„ SUFFUSALIS, Walk.	Calcutta.
„ TRIFASCIALIS, Moore.	Andamans.
„ OCHREALIS, Moore.	Andamans. S. India.
„ ACACIUSIALIS, Walk.	
„ BASTIALIS, Walk.	
MERCULIA BRACTEALIS, Walk.	Bengal.
AGLOSSA ARGENTALIS, Moore.	Darjiling.

## Tribe GEOMETRES.

*Family Larentiidæ.*

GANDARITES FLAVALA, Moore.	Bengal.
CIDARIA SUBSTITUTA, Walk.	Darjiling.
„ INTERPLAGATA, Guen.	Darjiling.
„ INEXTRICATA, Walk.	Darjiling.
„ ARGENTILINEATA, Moore.	Darjiling.
„ AURANTIARIA, Moore.	Darjiling.
„ SIGNATA, Moore.	Darjiling.
„ IRRIDATA, Moore.	Darjiling.
„ RETICULATA, Moore.	Bengal.
„ CINEREATA, Moore.	Bengal.
„ CALAMISTRATA, Moore.	Bengal.
„ SUBAPICARIA, Moore.	Darjiling.
„ TRISIGNATA, Moore.	Bengal.
„ CHALYBEARIA, Moore.	Darjiling.
„ OBSCURATA, Moore.	Bengal.

CIDARIA CERVINARIA, Moore.	Bengal.
„ AURATA, Moore.	Bengal.
COREMIA MEDIOVITTARIA, Moore.	Darjiling.
SCOTOSIA MINIOSATA, Walk.	Bengal.
„ ATROSTIPATA, Walk.	Bengal.
„ VITREATA, Moore.	Bengal.
„ LATIVITTARIA, Moore.	Darjiling.
„ OBLIQUISIGNATA, Moore.	Darjiling.
„ VENIMACULATA, Moore.	Bengal.
ARCHANNA FLAGIFERA, Walk.	Darjiling.
„ RAMOSA, Walk.	Darjiling.
„ TRAMESATA, Moore.	Bengal.
„ MACULATA, Moore.	Bengal.
„ MARMORATA, Moore.	Bengal.
PSYKA CUNEATA, Walk.	Bengal.
„ ANGULIFERA, Walk.	Darjiling.
„ SIMILARIA, Moore.	Darjiling.
OPORABIA MACULARIA, Moore.	Bengal.
LARENTIA VARIEGATA, Moore.	Bengal.
„ ÆRATA, Moore.	Darjiling.
EUPITHECIA SEMICIRCULATA, Moore.	Darjiling.
„ FERRUGINARIA, Moore.	Darjiling.
„ COSTIPANNARIA, Moore.	Bengal.
SACHIS DECUSSATA, Moore.	Bengal.
MELANIPPE CATENARIA, Moore.	Bengal.
„ CAPREATA, Moore.	Bengal.
ANTICLEA CUTREARIA, Moore.	Darjiling.

*Family Eubolidæ.*

ANAITIS MEDMARIA, Walk.	Darjiling.
<i>Eubolia reciproca</i> , Walk.	

*Family Zerenidæ.*

RHYPARIA DUCTARIA, Walk.	Bengal.
„ MACULATA, Moore.	Bengal.
„ TRANSECTATA, Walk.	Bengal.
PERCNA FELINARIA, Guen.	Bengal.
NELCYNDA RECTIFICATA, Walk.	Bengal.
ABRAXAS TIGRATA, Guen.	Bengal.
„ MARTARIA, Guen.	Bengal.
„ LEOPARDINATA, Kollar.	Bengal.
„ PARDARIA, Moore.	Bengal.
„ PICARIA, Moore.	Bengal.
„ IRRODATA, Moore.	Darjiling.
„ LAPSIATA, Walk.	Bengal.
„ TENEBRARIA, Moore.	Bengal.
VINDUSARA COMPOSITATA, Guen.	Bengal.
„ METACHROMATA, Walk.	Bengal.
POTERA MARGINATA, Moore.	Tenasserim.

*Family Fidonidæ.*

SPERRIA SACRARIA, L.	Bengal.
DOCHRAVA ÆQUILINEATA, Walk.	Bengal.
„ UVARIA, Walk.	Darjiling.
<i>Anaitis vastata</i> , Walk.	

ASPIATES FALCONARIA, Walk.	Darjiling.
„ OBLIQUARIA, Moore.	Bengal.
CAPRILLA VESICULARIA, Walk.	Cherra. Assam.
„ SPECTULARIA, Moore.	Assam.
ZOMIA INCITATA, Walk.	
„ PALLIDA, Moore.	Andamans.
OSICERDA ALIENATA, Walk.	Bengal.
‡ <i>Celsidera schistitiscata</i> , Walk.	
The larva feeds on <i>Leora</i> (Grote).	
„ COSTIMACULATA, Moore.	Bengal.
„ TRINOIARIA, Moore.	Bengal.
NOBILIA TURBATA, Walk.	Bengal.
MARCALA IGNIVORATA, Walk.	Bengal.

*Family* **Macariidæ.**

MACARIA METAGONARIA, Walk.	Darjiling.
„ PERSICUTARIA, Moore.	Bengal.
„ EMERSARIA, Walk.	Bengal. Burma.
„ ELLENORA, Cram.	Bengal. Burma.
The larva feeds on <i>Mimosa</i> flowers (Grote).	
„ NORA, Walk.	Andamans. Bengal. Ceylon. Java.
„ SIRENIATARIA, Walk.	Bengal.
„ SIRENCUTARIA, Walk.	Bengal.
„ PERMOTARIA, Walk.	Bengal.
„ INCHOATA, Walk.	Burma.
KRANANDA SEMIHYALINA, Moore.	Bengal.

*Family* **Microniidæ.**

MICRONIA GRAMMEARIA, Geyer.	Tenasserim. Bengal. Java.
„ VAGATA, Moore.	Andamans. Tenasserim.
„ ACULEATA, Guen.	Andamans. Silhet. Tenasserim. Java.
„ OBTUSATA, Guen.	Andamans. Java. Ceylon. Bengal.
„ OBLIQUARIA, Moore.	Andamans.
„ GANNATA, Guen.	Calcutta. Silhet.
„ FASCIATA, Cram.	Bengal.
<i>Phalena caudata</i> , Fabr.	
„ OBTUSATA, Guen.	Bengal.
„ SIMPLICIATA, Moore.	Bengal.
„ SPARSARIA, Walk.	Silhet.
„ STRIATARIA, L.	Bengal.
ORUDIZA PROTHECLARIA, Walk.	Burma.
MYRTETA PLANARIA, Walk.	Bengal.
EROSIA CERVINARIA, Moore.	Bengal.

*Family* **Caberidæ.**

CABERA PLATTLEUCATA, Walk.	Bengal.
„ MARGARITA, Moore.	Bengal.

*Family* **Acidalidæ.**

DRAPETODES MITARIA, Guen.	Bengal.
<i>Anisodes platycerata</i> , Walk.	
TRYGODES DIVISARIA, Walk.	Bengal. Andamans. S. India.
„ VAGATA, Walk.	Bengal.

HYRIA	BICOLORATA, Moore.	Bengal.
„	TRILINEATA, Moore.	Darjiling.
„	ORNATA, Moore.	Bengal.
„	PLURISTRIGATA, Moore.	Bengal.
„	MITIGATA, Walk.	Burma.
ACIDALIA	BICAUDATA, Moore.	Darjiling.
„	LEATA, Moore.	Darjiling.
„	TEPHROSARIA, Moore.	Bengal.
„	GEMMIFERA, Moore.	Bengal.
„	ATTENTATA, Walk.	Tenasserim. Andamans. Ceylon.
„	REMOTATA, Guen.	Andamans.
„	LIGATARIA, Walker.	Burma.
„	EMISSARIA, Walker.	Burma.
„	IMPRIMATA, Walker.	Burma.
„	REGULATA, Walker.	Burma.
BITHIA	EXCLUSA, Walker.	Tenasserim.
	<i>Acidalia imprimata</i> , Walker.	
	<i>Macaria obstataria</i> , Walker.	
	<i>Bithia lignaria</i> , Walker.	
ZANCLOPTERYX	SAPONARIA, H. Schaff.	Andamans.
TIMANDRA	CONVECTARIA, Walk.	Bengal.
„	AVENTIARIA, Guen.	Silhet. Burma.
„	SUBOBLIQUARIA, Moore.	Bengal.
„	SEMICOMPLETA, Walk.	Burma.
SOMAFINA	PLURILINEARIA, Moore.	Darjiling.
„	PICTARIA, Moore.	Darjiling.
„	ANTHOPHILATA, Guen.	Burma.
ARGYRIS	MYSTICATA, Walk.	Darjiling.
„	PELLARIA, Walk.	Burma.
„	OCELLATA, Friv.	Bengal.
„	<i>ommatophoraria</i> , Guen.	
„	INSIGNATA, Moore.	Bengal.

*Family* **Ephyridæ.**

ANISODES	OBLIVTARIA, Walk.	Bengal.
„	SIMILARIA, Walk.	Burma.
„	MOOREI, Theobald.	Bengal.
	<i>Anisodes similaria</i> , Moore (preoccupied).	
„	PLURISTRIARIA, Walk.	Bengal.
„	FLYUSARIA, Walk.	Silhet.
„	HYRIARIA, Walk.	Darjiling.
„	SANGUINARIA, Moore.	Bengal.
„	PALLIVITTATA, Moore.	Bengal.
„	DIFFUSARIA, Moore.	Bengal.
„	VINACEARIA, Moore.	Bengal.

*Family* **Palyadæ.**

EUMELEA	ROSALIA, Cram.	Bengal. Burma.
„	FELICIATA, Guen.	Silhet.
„	AUREIATA, Guen.	Bengal.
„	FIMBRIATA, Cram.	Burma.
„	LUDOVICATA, Guen.	Andamans. Ceylon.

*Family* **Geometridæ.**

GEOMETRA	AVICULARIA, Guen.	Darjiling.
----------	-------------------	------------

<i>Geometra pennisignata</i> , Walk.	
„ <i>viridibulbata</i> , Walk.	Darjiling.
„ <i>haliaria</i> , Walk.	Darjiling.
„ <i>decoraria</i> , Walk.	
„ <i>disnisiata</i> , Moore.	Darjiling.
„ <i>vittata</i> , Moore.	Bengal.
„ <i>plagiata</i> , Walk.	Darjiling.
„ <i>usia</i> , Walk.	Darjiling.
„ <i>dentata</i> , Walk.	Bengal.

The larva feeds on *Zizyphus* and *Leora*, attaching pieces of leaf to itself, apparently for the purpose of hiding its pupa case, but it commences adorning itself for some days before changing (Grote).

„ <i>discissa</i> , Walk.	Burma.
„ <i>lineata</i> , Moore.	Sikkim.
THALASSODES <i>inartaria</i> , Walk.	Silhet.
„ <i>macruraria</i> , Walk.	Silhet.
„ <i>macariata</i> , Walk.	Bengal.
„ <i>celataria</i> , Walk.	Bengal. Andamaus. Ceylon.
„ <i>dissimulata</i> , Walk.	Bengal. Burma.

The larva feeds on *Terminalia catappa* (Grote).

„ <i>distinctaria</i> , Walk.	Darjiling.
„ <i>trapteraria</i> , Walk.	Silhet.
„ <i>disita</i> , Walk.	Bengal.
„ <i>ophthalmicata</i> , Moore.	Bengal.
„ <i>sincata</i> , Moore.	Bengal.

The larva feeds on *Boswellia serratifolia* (Grote).

„ <i>sisunaga</i> , Walk.	Burma.
THALERA <i>bifasciata</i> , Walk.	Silhet.
„ <i>glaucaria</i> , Walk.	Darjiling.
„ <i>argutaria</i> , Walk.	Bengal.
„ <i>dirempta</i> , Walk.	Burma.
TODIS <i>opalaria</i> , Guen.	Burma.

*Thalera subtractata*, Walk.

BERTA <i>chrysolineata</i> , Walk.	Bengal.
COMBLENA <i>divapala</i> , Walk.	Bengal.

The larva feeds on *Lawsonia inermis* and *Melaleuca cajuputi* (Grote).

„ <i>sanguilineata</i> , Moore.	Bengal.
„ <i>hyalineata</i> , Moore.	Bengal.
„ <i>maculata</i> , Moore.	Bengal.
„ <i>fenestraria</i> , Moore.	Bengal.
„ <i>chalybeata</i> , Moore.	Darjiling.
AGATHIA <i>lycenaria</i> , Kellar.	Bengal. Burma.

*Geometra albiangularia*, Her. Schæff.

♀ *Agathia discriminata*, Walk.

The larva feeds on *Merium odorum* and *Strophanthus dichotomus* (Grote).

„ <i>hemithearia</i> , Guen.	Silhet.
„ <i>hilarata</i> , Guen.	Silhet.
„ <i>catenaria</i> , Walk.	Bengal.

The larva feeds on *Nerium oleander* (Grote).

„ <i>quinaria</i> , Moore.	Bengal.
„ <i>arcuata</i> , Moore.	Bengal.

Family **Boarmiidae.**

AMBLYCHIA	ANGERONARIA, Guen.	Bengal.
"	TORRIDA, Moore.	Andamans.
HEMEROPHILA	CREATARIA, Guen.	Darjiling.
"	STRINARIA, Guen.	Silhet. Burma.
"	MAFURARIA, Guen.	Bengal.
	<i>Elphos Parisuathi</i> , Walk.	
"	OBJECTARIA, Walk.	Darjiling.
"	CUPKEARIA, Moore.	Bengal.
"	NIGROVITATA, Moore.	Bengal.
"	BASISTRIGARIA, Moore.	Darjiling.
"	INTERRUPTARIA, Moore.	Bengal.
"	RETRACTARIA, Moore.	Darjiling.
"	HUMERARIA, Moore.	Bengal.
"	ATROSTIPATA, Walk.	Bengal.
BITHIA	EXCUSA, Walk.	Andamans.
	<i>Acidalia imprimata</i> , Walk.	
	<i>Mucaria obstataria</i> , Walk.	
	<i>Bithia lignaria</i> , Walk.	
CLLORA	VENUSTULARIA, Walk.	Darjiling.
"	DECUSSATA, Moore.	Darjiling.
"	REFORMARGINATA, Moore.	Darjiling.
"	FIMBRIATA, Moore.	Bengal.
"	MEGASTILARIA, Moore.	Bengal.
"	ALBIDENTATA, Moore.	Bengal.
"	PANNOSARIA, Moore.	Bengal.
"	SEMICLARATA, Walk.	Darjiling.
BOAEMIA	ALIENARIA, Walk.	Bengal.
"	<i>gelidaria</i> , Walk.	
"	VICARIA, Walk.	Silhet.
"	IMPARATA, Walk.	Darjiling.
"	ALBIDARIA, Walk.	Darjiling.
"	SUBLAVARIA, Guen.	Bengal. Burma.
"	TRISPINARIA, Walk.	Silhet.
"	TRANSISSA, Walk.	Silhet.
"	REPARATA, Walk.	Bengal.
"	OBLITERATA, Moore.	Bengal.
"	PERSPICUATA, Moore.	Bengal.
"	CONTIGUATA, Moore.	Bengal.
"	COMBUSTARIA, Walk.	Darjiling.
"	PROCESSARIA, Walk.	Burma.
"	PROCURSARIA, Walk.	Burma.
TEPHROSIA	SCRIPTARIA, Walk.	Darjiling.
"	COMPARATARIA, Walk.	Darjiling.
"	MUCIDARIA, Walk.	Darjiling.
"	DENTILINEATA, Moore.	Bengal.
HYPOCHROMA	DIFENSATA, Walk.	Batasor.
"	BOARMARIA, Guen.	Darjiling.
	<i>Boarmia inconclusa</i> , Walk.	
"	MUSCICOLORARIA, Walk.	Darjiling.
"	PERFECTARIA, Walk.	Bengal. Andamans.
"	<i>nyctemerata</i> , Walk.	
"	VRIDARIA, Moore.	Bengal.
"	IRROGATARIA, Moore.	Silhet.
"	BASIFLAVATA, Moore.	Bengal.
"	VARICOLORARIA, Moore.	Bengal.
"	TENEBRASARIA, Moore.	Bengal.

HYPOCHROMA COSTISTRIGARIA, Moore.	Bengal.
„ LLOPARDINATA, Moore.	Bengal.
„ FARVIA, Walk.	Burma.
BARGOSA FASCIATA, Moore.	Bengal.
XANDRAMES DIOLARIA, Moore.	Darjiling.
„ ALBOFASCIATA, Moore.	Darjiling.
OPHTHALMODES DIURNARIA, Guen.	Bengal.
„ INFUSARIA, Walk.	Silhet.
ELPHOS HYMENARIA, Guen.	Bengal.
„ PARDICELLATA, Walk.	Bengal.
GNOPHOS MUSCOSARIA, Walk.	Darjiling.
„ OBTECTARIA, Walk.	Darjiling.

*Family* **Amphidasidæ.**

AMPHIDASYS BENGALIARIA, Guen.	Silhet.
BUZURA MULTIPUNCTARIA, Walk.	Bengal.

The larva feeds on *Citrus* and *Cinamomum* (Grote).

*Family* **Fidonidæ.**

CORYMICA ARNEARIA, Walker.	Tenasserim.
TINOLEUS EBURNEIGUTTA, Walker.	Tenasserim.

*Family* **Cenochromidæ.**

MERGANA LEQUILINEARIA, Walk.	Bengal.
<i>Aurima trilineata</i> , Walk.	
„ RESTITUTARIA, Walk.	Bengal.
„ DEBITARIA, Walk.	Bengal.
„ BILINEATA, Moore.	Bengal.
COROTIA CERVINARIA, Moore.	Darjiling.

*Family* **Ennomidæ.**

LUXIARIA PHYLLOSARIA, Walk.	Bengal.
DREPANODES CIRCULITARIA, Walk.	Bengal.
„ ARGENTILINEA, Moore.	Bengal.
„ TRILINEARIA, Moore.	Darjiling.
„ QUINARIA, Moore.	Bengal.
„ FENESTRARIA, Moore.	Bengal.
DECETIA CAPETUSARIA, Walk.	Silhet.
AGNIDRA SPECULARIA, Walk.	Bengal.
„ MUSCULARIA, Walk.	Bengal.
„ DISCIPILARIA, Moore.	Bengal.
HYPERYTHRA LUTEA, Cram.	Bengal. Andamans. Java.
„ LIMBOLARIA, Guen. ♀	Tenasserim. Bengal. S. India.
<i>Aspilates susceptaria</i> , Walk.	
<i>Hyperythra penicillaria</i> , Guen. ♂	
„ NIGUZARIA, Walk.	Silhet.
„ VITTICOSTATA, Walk.	Silhet.
„ SPURCATARIA, Walk.	Darjiling.
„ CALCEARIA, Walk.	Bengal.
„ TRILINEATA, Moore.	Bengal.
„ ANGULIFASCIA, Moore.	Andamans.
CAUSTOLOMA ENNOMOSARIA, Walk.	Darjiling.
ANGERONA FALPICOSTARIA, Moore.	Bengal.



OMIZA PACHIARIA, Walk.	Bengal.
„ SCHISIACEA, Moore.	Tenasserim.
„ AFFINIS, Moore.	Andamans.
PANISALA TRUNCARIA, Moore.	Bengal.
ERYMENE INUSTARIA, Moore.	Bengal.
OBONTOPTERA DISCOSPIATA, Moore.	Bengal.
SELENIA DECORATA, Moore.	Bengal.
ENDROPIA BASIFUNCTA, Moore.	Bengal.
CROCALIS OBLIQUARIA, Moore.	Bengal.
„ BIVITTARIA, Moore.	Bengal.
„ LENTIGINOSARIA, Moore.	Bengal.
„ ANGULARIA, Moore.	Bengal.
ENXOMOS VIRIDATA, Moore.	Bengal.
„ TESTACEARIA, Moore.	Darjiling.
GARLEUS SPECULARIS, Moore.	Darjiling.
LYCIMNA POLYMISATA, Walk.	Silhet.
EREBOMORPHA FULGURITA, Walk.	Bengal.
„ FULGURARIA, Walk.	Bengal.
LITBADA SERICEARIA, Walk.	Silhet.

*Family Uraptericidæ.*

URAPTERYX PODALIRIATA, Guen.	Tenasserim.
„ CROCOTERATA, Kellar.	Andamans. Bengal.
„ FIBULEATA, Guen.	Bengal.
„ MULLESTRIGARIA, Walk.	Bengal.
„ SCHISCAUDARIA, Walk.	Darjiling.
„ PODALIRIATA, Guen.	Tenasserim. Calcutta. Sikkim.
„ MARGARITATA, Moore.	Bengal.
„ TRIANGULARIA, Moore.	Bengal.
„ RUFIVINCTATA, Walk.	Darjiling.
„ QUADRIFUNCTATA, Moore.	Bengal.
„ FALCATA, Moore.	Darjiling.
EUCHERA SUBSTIGMARIA, Hubn.	Bengal.
<i>Abracus capitata</i> , Walk.	
CHORODXA EREBUSARIA, Walk.	Darjiling.
„ METAPHLEARIA, Walk.	Darjiling.
<i>Erebomorpha semiclusaria</i> , Walk.	
„ PALLIDULARIA, Moore.	Darjiling.
„ VULPINARIA, Moore.	Darjiling.
„ MURICOLARIA, Walk.	Darjiling.
„ FLAGIBOTATA, Walk.	Darjiling.
„ RECTATA, Walk.	Darjiling.
„ PATULATA, Walk.	Darjiling.
DALIMA APICATA, Moore.	Bengal.
„ SCHISTACEARIA, Moore.	Bengal.
CHERODES TESTACEATA, Moore.	Bengal.
LAGYRA DECEPTATURA, Walker.	Burma.
<i>Chizala deceptatura</i> .	
„ MEGASPILA, Moore.	Bengal.
„ RIGUSARIA, Walk.	Bengal.
The larva feeds on the Rose (Grote).	
CIMICODES CASTANEARIA, Moore.	Darjiling.
„ COSTALIS, Moore.	Bengal.
„ CRUENTARIA, Moore.	Bengal.
AUZEIA APICATA, Moore.	Bengal.
„ TORRIDARIA, Moore.	Bengal.

## Tribe CRAMBICES.

*Family* **Galleridæ.**

PROPACHYS NIGRIVENA, Walk.	Darjiling.	
„ LINEALIS, Moore.	Darjiling.	Andamans.
„ FASCIALIS, Moore.	Bengal.	
TOCCOLOSIDA RUBRICETS, Walk.	Silhet.	

*Family* **Crambidæ.**

ESCHATA GELIDA, Walk.	Darjiling.
APURIMA XANTHOGASTRELLA, Walk.	Bengal.
<i>Rupela degenerella</i> , Walk.	
<i>Lithosia cramboides</i> , Walk.	
SCIRPOPHAGA AURIFLUA, Zeller.	Calcutta.
„ GILVIBERBIS, Zeller.	Bengal.
BRIHASPA ATROSTIGMELLA, Moore.	Darjiling.
RAMILA MARGINELLA, Moore.	Darjiling.
CRAMBUS CONSOCIELLUS, Walk.	Bengal.
ACARA MOROSELLA, Walk.	Silhet.
SCHENOBIVS MINUTELLUS, Zeller.	Calcutta.
„ PUNCTELLUS, Zeller.	Calcutta.
CALAMOTROPHA ATKINSONI, Zeller.	Calcutta.
CHILO ADITELLUS, Walker.	Burma.

*Family* **Phycidæ.**

NEPHOPTERYX MERIDIONALIS, Wallace.	Burma.
------------------------------------	--------

## Tribe DELTOIDES.

*Family* **Herminiidæ.**

HERMINIA HADENALIS, Moore.	Darjiling.
„ OCHRACEALIS, Moore.	Darjiling.
„ ALBIRENALIS, Moore.	Darjiling.
MASTYGOPHORA SCOTIGERALIS, Moore.	Bengal.
EBHANA PLICALIS, Moore.	Darjiling.
LOCASTRA PHERECIUSCALIS, Walk.	Silhet.
„ CUPROVIRIDALIS, Moore.	Darjiling.
BEKTULA HISBONALIS, Walk.	Silhet.
„ BREVVITTALIS, Moore.	Bengal.
„ CHALYBEALIS, Moore.	Darjiling.
„ STIGMATALIS, Moore.	Bengal.
„ ALBINOTALIS, Moore.	Andamans.
„ IMPARATALIS, Walk.	Burma.
BOCANA BASALIS, Moore.	Bengal.
„ VIRIDALIS, Moore.	Bengal.
„ QUADRILINEALIS, Moore.	Darjiling.
„ MURINALIS, Moore.	Bengal.
APHADANA EVULSALIS, Walker.	Andamans.
HYDRILLODES SUBBASALIS, Moore.	Andamans.
„ TRANSVERSALIS, Moore.	Andamans.
CYCLOPTERYX CANALIFERALIS, Moore.	Andamans.
RIVULA BIOCULARIS, Moore.	Andamans.
„ OCULARIS, Moore.	Andamans.

*Family* **Hypenidæ.**

DICHROMIA OROSIALIS, Cram.	Bengal.
„ TRIPICALIS, Walk.	Darjiling.

TALAPA CALIGINOSALIS, Walk.	Darjiling.
ANGRATHA COSTALIS, Moore.	Darjiling.
HYALINA LESALIS, Walk.	Burma.
„ QUINQUELINEARIS, Moore.	Andamans.
„ DENTILINEARIS, Moore.	Andamans.
„ LACESSALIS, Walk.	Bengal.
„ ABDUCALIS, Walk.	Bengal.
„ CONSCITALIS, Walk.	Cherra.
„ EXTENSA, Walk.	Bengal.
„ TENEBRALIS, Moore.	Bengal.
„ CERVINALIS, Moore.	Bengal.
„ COSTINOTALIS, Moore.	Darjiling.
„ CASTANEALIS, Moore.	Darjiling.
„ RECTIVITALIS, Moore.	Bengal.
„ BASISTRIGALIS, Moore.	Cherra. Darjiling.
„ DIVISALIS, Moore.	Darjiling.
„ LONGIPENNIS, Walk.	Darjiling.

*Family* **Platydidæ.**

EPISPARIS VARIALIS, Walk.	Andamans. Bengal. Ceylon.
„ <i>signata</i> , Walk.	
„ SEJUNCTALIS, Walk.	Bengal.
<i>Pradiola sejunctaria</i> , Walk.	
„ <i>ennomocoides</i> , Walk.	
„ TORTUOSALIS, Moore.	Bengal.

Tribe PSEUDO-DELTOIDES.

*Family* **Amphigonidæ.**

LACERA CAPELLA, Guen.	Bengal. Burma.
AMPHIGONIA HEPATIZANS, Guen.	Burma.
„ COMPRIMENS, Walk.	Silhet.

*Family* **Focillidæ.**

ZETHES XYLOCHROMA, Walk.	Silhet.
„ PERTURBANS, Walk.	Silhet.
„ ILESTANS, Walk.	Burma.
PHALACRA METAGONARIA, Walk.	Bengal.
THYRIDOSPILA SPILERIPHORA, Moore.	Bengal.
PHURYS OBLIQUA, Moore.	Bengal.
„ STRIGATA, Moore.	Bengal.
EGNASIA EPHYRODALIS, Walk.	Bengal.
„ TRIMANTESALIS, Walk.	Darjiling.
„ VAGA, Walk.	Silhet.
„ TALUSALIS, Walker.	Burma.
„ REDUPLICATIONIS, Walker.	Burma.
MARMORINIA SINGHA, Guen.	Silhet.
„ SHIVULA, Guen.	Silhet.
MECODINA LANCEOLA, Guen.	Silhet.
SINGARA DIVERSALIS, Walk.	Silhet.
HYPERNARIA DISCTRIGA, Moore.	Bengal.
FASCELLINA CHROMALARIA, Walk.	Bengal.
„ VIRIDIS, Moore.	Bengal.
„ CASTANEA, Moore.	Andamans.
PLEURONA FALCATA, Walk.	Andamans.
CAPNODES RUFESCENS, Moore.	Andamans.
„ TRIFASCIATA, Moore.	Andamans.

*Family Thermesiidæ.*

SYMPIS RUFIBASIS, Guen.	Silhet.
The larva feeds on the 'Lichi,' <i>Nephelium litchi</i> (Grote).	
„ TURBIDA, Moore.	Andamans.
THERMESIA CRELEREIMA, Walk.	Silhet.
„ PRECIPUA, Walk.	Silhet.
„ ARINACEA, Walk.	Silhet.
„ CONSOCI, Walk.	Silhet.
„ RETICULATA, Walk.	Darjiling. Andamans. Ceylon.
<i>Drepanodes scitaria</i> , Walk.	
<i>Anisodes pyrriniata</i> , Walk.	
The larva feeds on <i>Elaeocarpus serratus</i> (Grote).	
AZAZIA RUBRICANS, Boisid.	Andamans. Java. Bengal. Burma. Ceylon.
<i>Thermesia transducta</i> , Walk.	
SELENIS IRRITA, Walk.	Bengal. Burma.
„ <i>niviapex</i> , Walk.	
„ ABRUPTA, Walk.	Bengal.
The larva feeds on the flowers of <i>Zizyphus</i> (Grote).	
„ ( <i>Mestleta</i> ) DUPLEXA, Moore.	Andamans.
„ LONGIPALPIS, Walker.	Burma.
BALLATHA LETA, Walker.	Burma.

## Tribe NOCTUES.

*Family Poaphilidæ.*

ILCUA PYRALINA, Moore.	Andamans.
POAPHILA MARGINATA, Walker.	Burma.
BANIANA LUTEICEPS, Walker.	Burma.
NAHARA CLAVIFERA, Walker.	Burma.

*Family Remigiidæ.*

REMIGIA ARCHESIA, Cram.	Andamans. Java. Ceylon. Bengal.
<i>Ph.-noctua virbia</i> , Cram.	
„ <i>bifasciata</i> , Walk.	
„ FRUGALIS, Fabr.	Bengal. Burma.
<i>Chalciope lycopodia</i> , Geyer.	
„ OPTATURA, Walker.	Burma.
„ GREGALIS, Guen.	Andamans. Java.
FELINIA TERMINIGERA, Walk.	Burma.
„ SPISSA, Guen.	Silhet.

*Family Euclididæ.*

TRIGONODES HYPPASIA, Cram.	Bengal. Burma.
„ CEPHISE.	Burma.
„ MAXIMA, Guen.	Burma.

*Family Ophiuidæ.*

SPHINGOMORPHA CHLOREA, Cram.	Bengal.
<i>Sphingomorpha sipyla</i> , Guen.	
TONTIA UMBRINA, Doubl.	Silhet.
LAGOPTERA HONESTA, Hübner.	Balasar. Burma. Andamans. Ceylon.
„ CORONATA, Fabr.	Andamans. Manthura. Burma. Ceylon.
„ <i>leonina</i> , Fabr.	

<i>Lagoptera magica</i> , Hübn.	
„ <i>notata</i> , Fabr.	Bengal. Burma.
OPHIODES <i>TRAPEZIUM</i> , Guen.	Bengal.
„ <i>SEPERANS</i> , Walk.	Bengal.
„ <i>CUPREA</i> , Moore.	Bengal.
OPHISMA <i>GRAVATA</i> , Guen.	Bengal.
„ <i>MATURESCENS</i> , Walk.	Bengal.
„ <i>CLEPHOR</i> , Walk.	Burma.
„ <i>CONTENTA</i> , Walk.	Burma.
COTUZA <i>UMMINIA</i> , Cram.	Bengal.
♀ <i>Sympis subunita</i> , Guen.	
♀ <i>Ginea remorens</i> , Walk.	
♂ <i>Cotuza drepanoides</i> , Walk.	
„ <i>DEFICIENTS</i> , Walk.	Bengal.
<i>Remigia pygidifissa</i> , Walk.	
<i>Ophisma conulifera</i> , Walk.	
HEMEROBLEMMA <i>PEROPACA</i> , Hübn.	Bengal.
„ <i>Ophisma latabilis</i> , Guen.	
ACHILIA <i>MELICERTE</i> , Drury.	Andamans. Java. India. Ceylon.
„ <i>tigrina</i> , Fabr.	
„ <i>NUBIFERA</i> , Moore.	Andamans.
„ <i>MERCATORIA</i> , Fabr.	Bengal.
„ <i>CYLLOTA</i> , Guen.	Burma.
SEBRODES <i>CAMPANA</i> , Guen.	Bengal.
NAXIA <i>CIRCUMSIGNATA</i> , Guen.	Silhet.
„ <i>ONELIA</i> , Guen.	Bengal.
„ <i>Ophiusa obumbrata</i> , Walk.	
„ <i>umbrosa</i> , Walk.	
„ <i>CALEFACIENS</i> , Walk.	Bengal.
„ <i>CALORIFICA</i> , Walk.	Silhet.
CALIESIA <i>COMOSA</i> , Guen.	Bengal. Burma.
„ <i>GASTROPACHOIDES</i> , Guen.	Sikkim. Tenasserim. Java.
„ <i>STIGMOLEUCA</i> , Koll.	Burma.
„ <i>FLABELLIFERA</i> , Moore.	Tenasserim.
HYPLETRA <i>NOCTOIDES</i> , Guen.	Silhet. Burma.
„ <i>GAMMOIDES</i> , Walk.	Bengal.
„ <i>Poaphila hamata</i> , Walk.	
„ <i>STIGMATA</i> , Moore.	Andamans.
ATHYRMA <i>POLYSTILA</i> , Walk.	Silhet. Burma.
„ <i>DIVULSA</i> , Walk.	Silhet.
„ <i>TESSALATA</i> , Moore.	Bengal.
OPHIUSA <i>MYOPS</i> , Guen.	Bengal. Burma.
„ <i>ANALIS</i> , Guen.	Burma.
„ <i>ACHIATINA</i> , Sulz.	Bengal. Burma.
„ <i>FULVOTENIA</i> , Guen.	Silhet. Burma.
„ <i>ARCUATA</i> , Moore.	Andamans. Bengal. Burma.
„ <i>joriana</i> , Cram. apud Guen.	
„ <i>ALBIVITTA</i> , Guen.	Bengal.
„ <i>ARCTOTENIA</i> , Guen.	Silhet.
„ <i>STUPOSA</i> , Fabr.	Silhet.
GRAMMODES <i>STOLIDA</i> , Fabr.	Bengal.
„ <i>AMMONIA</i> , Cram.	Bengal. Burma.
„ <i>MYGDON</i> , Cram.	Bengal. Burma.
„ <i>NOTATA</i> , Fabr.	Bengal.
FODINA <i>ORIOLES</i> , Guen.	Bengal.
„ <i>PULLULA</i> , Guen.	Bengal.
„ <i>STOLA</i> , Guen.	Tenasserim. Sikkim. S. India.
ARTENA <i>SUBMIRA</i> , Walk.	Tenasserim.

*Family Bendidæ.*

MELODES CARANA, Cram.	Bengal.	Burma.
„ SATURNIODES, Guen.	Burma.	
„ PALLASIA, Guen.	Bengal.	Burma.
<i>Remigia alligons</i> , Walk.		
„ EUSPORANS, Walker.	Bengal.	Burma.
„ INANGULATA, Guen.	Bengal.	

*Family Hypopyridæ.*

SPIRAMA HELICINA, Hübn.	Bengal.	Tenasserim.	Ceylon.
„ COLLERENS, Walk.	Andamans.	N.E. Bengal.	Ceylon.
„ TRILOBA, Guen.	Bengal.		
<i>Hypopyga mollis</i> , Guen.			
„ RETORTA, L.	Burma.		
HYPOPYGA VESPERTILIO, Fabr.	Bengal.	Burma.	
„ FENISECA, Guen.	Silhet.		
„ OSSIGERA, Guen.	Bengal.		
„ FENISERIGATA, Guen.	Bengal.	Burma.	
<i>Marula idonea</i> , Walk.			
<i>Angerona poeasaria</i> , Walk.			
„ PELSIMILIS, Moore.	Andamans.		
HAMODES AFRANTIAEA, Guen.	Bengal.		
„ DISCISEIGA, Moore.	Andamans.	N.E. Bengal.	
EXTOMOGRAMMA FAUTIX, Guen.	Andamans.	Java.	N.E. Bengal.
BERIGRA REPLENENS, Walk.	Bengal.		

*Family Ommatophoridæ.*

SPIREEDONIA FEDUCIA, Stoll.	Silhet.		
„ CONSPICUA, Feld.	Andamans.		
„ ZANIES, Stoll.	Silhet.		
„ RETRAHENS, Walk.	Andamans.	Java.	S. India.
<i>Scricca parvipennis</i> , Walk.			
PATULA MACROPS, L.	Bengal.		
<i>Noctua bubo</i> , Fabr.			
ARGIVA HIEROGLYPHICA, Drury.	Tenasserim.	Andamans.	Bengal.
<i>Phalana mygdonia</i> , Cram.			
„ <i>harmonia</i> , Cram.			
„ CAPRIMULGUS, Fabr.	Tenasserim.	Bengal.	
NYCTIPAO CREPUSCULARIS, L.	Tenasserim.	Bengal.	Java.
„ GEMMANS, Guen.	Silhet.		
„ GLAUCOPIS, Walk.	Silhet.		
„ OBLITERANS, Walk.	Bengal.		
„ <i>exterior</i> , Walk.			
„ TRUNCATA, Moore.	Andamans.		
HETEROBLEMMA PEROPACA, Hübn.	Burma.		
<i>Ophisma latabilis</i> , Guen.			
OMMATOPHORA LUMINOSA, Cram.	Bengal.		

*Family Erebidæ.*

OXYODES CLYTIA, Cram.	Burma.
SYNA ALBILINEA, Walk.	Silhet.
„ CÆLISPARSA, Walk.	Assam.
„ CURVILINEA, Moore.	Bengal.
„ RECTILINEA, Moore.	Bengal.
„ CYANIVITTA, Moore.	Bengal.

TAVIA SUBSTRUCENS, Walk.	Andamans. N.E. Bengal.
„ PUNCTOSA, Walk.	Bengal.
„ DUBITARIA, Walk.	Bengal.
„ CALIGINOSA, Walk.	Bengal.
„ ALBILINEA, Walk.	Bengal.
„ SUBMARGINATA, Walk.	Bengal.
„ BIOCULARIS, Moore.	Bengal.
„ CATOCALOIDES, Moore.	Bengal.
ANISONURA SALEBROSA, Guen.	Silhet.
„ HYPOCYANA, Guen.	Silhet.

*Family* **Phyllodidæ.**

PHYLLODES CONSOBRINA, Westw.	Andamans. Bengal.
„ USTULATA, Westw.	Bengal.
„ FASCIATA, Moore.	Bengal.
POTAMOPHORA MANLIA, Cram.	Bengal. Burma.
LYGNIODES HYPOLEUCA, Guen.	Bengal. Burma.
„ CILIATA, Moore.	Bengal.

*Family* **Catocalidæ.**

CATOCALA NERCHA, Moore.	Darjiling.
„ ALBIFASCIA, Walk.	Burma.
„ DOTATA, Walk.	Bengal.
BLENINA LICHENOSA, Moore.	Andamans.
„ GRISEA, Moore.	Andamans.
OPHIPORES MATERNA, L.	Bengal.
„ FULLONICA, L.	Andamans. Sumatra. N.E. Bengal. Ceylon.
<i>Nautua dioscureæ</i> , Fabr.	
<i>Phalæna-noctua pomona</i> , Cram.	
„ HYPERMINESTRA, Cram.	Andamans. Sumatra. N.E. Bengal. Ceylon.
„ CAIETA, Hübn.	Bengal. Burma.
„ SALAMINIA, Cram.	Bengal.
„ PLANA, Walk.	Bengal.
„ AURANTIA, Moore.	Andamans.

*Family* **Hypocalidæ.**

HYPOCALA DEFLORATA, Fabr.	Bengal.
„ EFFLORESCENS, Guen.	Bengal.
„ ROSTRATA, Fabr.	Bengal.
„ SUBSATURA, Guen.	Bengal.
„ LATIVITTA, Moore.	Andamans.

*Family* **Catephiidæ.**

COCYTODES CÆRULEA, Guen.	Silhet.
„ MODESTA, Van der Hoeven.	Bengal.
„ <i>immodesta</i> , Guen.	
CATEPHIA LINTEOLA, Guen.	Bengal.
ANOPHIA OLIVASCENS, Guen.	Andamans. N.E. Bengal. Java. Ceylon.
„ LATERALIS, Walk.	Burma.
„ ACRONYCTOIDES, Guen.	Bengal.
ERYGIA APICALIS, Guen.	Bengal. Burma.
<i>Calicula exempta</i> , Walk.	
ODONTODES BOLINOIDES, Walk.	Bengal. Burma.
<i>Steiria subfasciata</i> , Walk.	
„ <i>quadristrigata</i> , Walk.	

STRICTOPTERA ILLUCIDA, Walk.	Calcutta.
„ GRISEA, Moore.	Darjiling.
„ DENTICULATA, Walk.	Burma.

*Family* **Hypogrammidæ.**

ERCHEIA TENEBROSA, Moore.	Andamans. N.E. Bengal.
BRIADA PRECEDENS, Walk.	Bengal.
„ VARIANS, Moore.	Bengal.
„ CERVINA, Walk.	Bengal.
CALLYXA SIDEREA, Guen.	Silhet.
„ MONOLEUCA, Walk.	Darjiling.
DINUMMA MYSTICA, Walk.	Burma.
GADIRTHA INEXACTA, Walk.	Burma.
„ IMPINGENS, Walk.	Burma.

*Family* **Homopteridæ.**

ALAMIS ALBICINCTA, Guen.	Bengal.
„ OPTATURA, Walk.	Bengal.
„ CONTINUA, Walk.	Bengal.
„ GLAUCINANS, Guen.	Bengal.
HOMOPTERA INFLIGENS, Walk.	Bengal.
„ SOLITA, Walk.	Burma.

*Family* **Polydesmidæ.**

PANDESMA QUENAVADI, Guen.	Silhet.
POLYDESMA BOARMOIDES, Guen.	Andamans. N.E. Bengal. Ceylon.
<i>Alamis brevipalpis</i> , Walk.	
<i>Polydesma mastrucata</i> , Feld.	
„ SCRIPTILIS, Guen.	Silhet.
„ OTIOSA, Guen.	Silhet.

*Family* **Amphipyridæ.**

AMPHIPYRA MONOLITHA, Guen.	Bengal.
NÆNIA CUPREA, Moore.	Bengal.
„ CHALYBEATA, Moore.	Bengal.

*Family* **Toxocampidæ.**

TOXOCAMPA TETRASPILA, Walk.	Darjiling.
„ COSTIMACULATA, Guen.	Silhet.
<i>Remigia triangulata</i> , Walk.	

*Family* **Gonopteridæ.**

ANOMIS FULVIDA, Guen.	Andamans. N.E. Bengal. Java. Ceylon.
„ GUTTANIVIS, Walk.	Bengal.
THALATTA PRECEDENS, Walk.	Burma.
GONITIS LATIMARGO, Walk.	Burma.
COSMOPHILA XANTHIDYMA, Boisd.	Bengal.
<i>Cirradia variolosa</i> , Walk.	
The larva feeds on <i>Hibiscus</i> (Grote).	
OSSONOBIA TORPIDA, Walk.	Bengal.



*Family Hyblæidæ.*

HYBLEA PTERA, Cram.	Bengal.	Burma.
The larva feeds on <i>Bignonia</i> and <i>Callicarpa</i> (Grote).		
„ CONSTELLATA, Guen.	Bengal.	
„ FIRMAMENTUM, Guen.	Bengal.	
NOLASENA DULCISSIMA, Walk.	Andamans.	Ceylon.
PHYCODES HIRUNDINICORNIS, Guen.	Bengal.	
<i>Tigna hyblæella</i> , Walk.		
The larva feeds on <i>Picus indica</i> (Grote).		
„ MINOR, Moore.	Bengal.	
„ MACULATA, Moore.	Bengal.	

*Family Plusiidæ.*

ABROSTOLA SUBAPICALIS, Walk.	Calcutta.	
<i>Ingura recurvens</i> , Walk.		
PLUSIODONTA ACRIFERA, Hübn.	Bengal.	
The larva found on Cabbages.		
„ VERTICILLATA, Walk.	Calcutta.	
The larva found on Geranium (Grote).		
„ AGRAMMA, Guen.	Calcutta.	
„ <i>inchoata</i> , Walk.		
The larva feeds on the 'Kadu,' <i>Lagenaica vulgaris</i> (Grote).		
„ SIGNATA, Fabr.	Bengal.	
„ FURCIFERA, Walk.	Bengal.	
„ ORNATISSIMA, Walk.	Bengal.	
„ GEMMIFERA, Walk.	Bengal.	
„ SEMIVITIA, Moore.	Darjiling.	
„ VERTICILLATA, Guen.	Burma.	

*Family Calpidæ.*

„ CONDUCENS, Walk.	Andamans.	Ceylon.
The larva feeds on <i>Clypea</i> and <i>Cissampelos</i> (Grote).		
ORÆSIA PROVOCANS, Walk.	Silhet.	
„ RECTESTRIA, Guen.	Bengal.	
„ EMARGINATA, Fabr.	Bengal.	
CALPE MINUTICORNIS, Guen.	Bengal.	

*Family Hemiceridæ.*

WESTERMANNIA TRIANGULARIS, Moore.	Andamans.
-----------------------------------	-----------

*Family Eurhipidæ.*

ANUGA CONSTRICTA, Guen.	Bengal.	
„ LUNULATA, Moore.	Bengal.	
INGURA CRISTATRIX, Guen.	Andamans.	Java.
EUTELIA ADULATRIX, Hübn.	Burma.	
<i>Targalia infida</i> , Walker.		
<i>Penicillaria ludatrix</i> .		
„ SICCIFOLIA, Moore.	Darjiling.	
VARNA IGNITA, Walk.	Silhet.	
„ FENESTRATA, Moore.	Darjiling.	
„ INÆQUALIS, Walk.	Silhet.	

*Family Eriopidæ.*

CALLOPISTRIA EXOTICA, Guen.	Andamans, Java, Darjiling, Ceylon.
„ DUPLICANS, Walk.	Burma.
PHALGA SINUOSA, Moore.	Darjiling.

*Family Erastridiæ.*

ERASTRIA VENULIA, Cram.	Bengal.
„ IMBUTA, Walk.	Burma.
„ PALLIDISCA, Moore.	Darjiling.
„ MARGINATA, Moore.	Darjiling.
PROTHEDES BIPARS, Moore.	Cherra.

*Family Palindidæ.*

HOMODES CROCEA, Guen.	Andamans. Ceylon. Java.
„ DISCISTRIGA, Moore.	Andamans.

*Family Acontiidæ.*

XANTHODES TRANSVERSA, Guen.	Bengal. Andamans. Java.
„ INTERSEPTA, Guen.	Bengal. Burma.
„ IMPELLENS, Walk.	Bengal.
„ INNOCENS, Walk.	Bengal.
„ IMPARATA, Walk.	Bengal.
CANNA FULCHRIPICTA, Walk.	Darjiling.
ACONTIA OLIVEA, Guen.	Bengal.
Larva feeds on the <i>Solanum melongena</i> (Grote).	
„ TROPICA, Guen.	Bengal.
„ SIGNIFERA, Walk.	Calcutta. N.E. Bengal. Andamans.
CHURIA NIGRISIGNA, Moore.	Calcutta.
„ OCHRACEA, Moore.	Calcutta.

*Family Heliothidæ.*

MASALIA IRRORATA, Moore.	Darjiling.
ADISURA ATKINSONI, Moore.	Darjiling.
„ MARGINALIS, Moore.	Calcutta.
„ DULCIS, Moore.	Darjiling.
„ SIMILIS, Moore.	Calcutta.

*Family Anthophilidæ.*

ANTHOPIILA HÆMORRHODA, Walk.	Bengal.
<i>Micra hemirhoda</i> , Walk.	
<i>A. roscefascia</i> , Walk.	
HYDRELIA SEMILUGENS, Walk.	Burma.
„ CONJUGATA, Moore.	Darjiling.
THALPOCHARES TRIFASCIATA, Moore.	Calcutta.
„ QUADRILINEATA, Moore.	Calcutta.
„ DIVISA, Moore.	Calcutta. Ceylon.
ACANTHOLIPES HYFENOIDES, Moore.	Darjiling.

*Family Xylinidæ.*

CUCULLIA TENUIS, Moore.	Darjiling.
-------------------------	------------

*Family* **Heliothidæ.**

HELIOTHIS ARMIGERA, Hübn.	Bengal.
„ FELTIGERA, Tröit.	Bengal.

*Family* **Hamerosidæ.**

AFSARASA FIGURATA, Moore.	Andamans.
---------------------------	-----------

*Family* **Hadenidæ.**

AGRIOPSIS LEPIDA, Moore.	Bengal.
„ DISCALIS, Moore.	Bengal.
EUPLEXIA ALBOVITTATA, Moore.	Darjiling.
„ DISCISIGNATA, Moore.	Darjiling.
„ STRIATOVIRENS, Moore.	Darjiling.
„ DISTORTA, Moore.	Darjiling.
EUCOIS AURIPLENA, Walk.	Bengal.
„ CRASSIPENNIS, Walk.	Silhet.
HADENA CONSTELLATA, Moore.	Darjiling.
„ ATROVIRENS, Moore.	Darjiling.
„ AUROVIRIDIS, Bengal.	Bengal.
„ ALBIDISCA, Moore.	Bengal.
„ LANCEOLA, Moore.	Bengal.
„ SPARGENS, Walk.	Burma.
CHLOCTA FORTISSIMA, Moore.	Darjiling.
SARRANISSA INSOCIA, Walk.	Darjiling.
DIANTHECTA CONFLUENS, Moore.	Darjiling.
UPPANA INDICA, Moore.	Darjiling.
BERRILEA AURIGERA, Walk.	Darjiling.
„ MEGASTIGMA, Walk.	Darjiling.
„ ALBINOIA, Moore.	Darjiling.
„ OLIVACEA, Moore.	Darjiling.

*Family* **Orthosidæ.**

ORTHOSIA CURVIPLENA, Walk.	Darjiling.
„ EXTERNA, Walk.	Darjiling.
„ SINES, Walk.	Burma.
„ RECTIVITA, Moore.	Darjiling.
DABARITA SUBTILIS, Walk.	Bengal.

The larva feeds on *Eugenia jambolana* (Grote).

*Family* **Noctuidæ.**

AGROTIS SUFFUSA, Gmel.	Bengal.
„ COSTIGERA, Moore.	Cherra.
EPILECTA PULCHERRIMA, Moore.	Darjiling.
TRIPHLENA SEMIHERRIDA, Walk.	Bengal.
GRAPHIPHORA C-NIGRUM, L.	Bengal.
„ CERASTIODES, Moore.	Darjiling.
„ FASCIATA, Moore.	Darjiling.
„ BASISTRIGA, Moore.	Darjiling.
„ RUBICILIA, Moore.	Darjiling.
„ FLAVIVENA, Moore.	Darjiling.
„ NIGROSIGNA, Moore.	Tonglu, in Sikkim.
OCHROPLEURA FLAMMATICA, Gmel.	Bengal.
<i>Agrotis basiclavis</i> , Walk.	

OCHROPLEURA	RENALIS, Moore.	Bengal.
„	SPILOTA, Moore.	Bengal.
„	TRIANGULARIS, Moore.	Darjiling.
„	COSTALIS, Moore.	Darjiling.
TIRACOLA	PLAGIATA, Walk.	Darjiling.
MEGASEMA	CINNAMOMEA, Moore.	Darjiling.
HERMONASSA	CHALYBEATA, Moore.	Darjiling.
„	SINUATA, Moore.	Darjiling.
„	CONSIGNATA, Walk.	Darjiling.

*Family* **Episemidæ.**

HELIOPHOBUS	DISSECTUS, Walk.	Bengal.
-------------	------------------	---------

*Family* **Apamiidæ.**

MAMESTRA	INFAUSTA, Walk.	Bengal.
„	CHALYBEATA, Walk.	Darjiling.
„	METALLICA, Walk.	Darjiling.
„	NIGROCUPREA, Moore.	Bengal.
„	SUFFUSA, Moore.	Bengal.
„	ALBOMACULATA, Moore.	Darjiling.
„	ALBIRENA, Moore.	Calcutta. Darjiling.
„	SIKKIMA, Moore.	Darjiling.
PROSPALTA	LEUCOSPILA, Moore.	Darjiling.
ILATIA	MONILIS, Moore.	Darjiling.
„	CERVINA, Moore.	Darjiling.
„	CALAMISTRATA, Moore.	Khasi hills.
„	CEPHUSALIS, Walk.	Andamans. S. India.
<i>Miana inornata</i> , Walk.		
CELENA	SIKKIMENSIS, Moore.	Sikkim.
HYDRECIA	KHASIANA, Moore.	Khasi hills.
PERIGEA	TRICYCLA, Guen.	Silhet.
„	APAMEOIDES, Guen.	Bengal. Andamans. S. India.
♂ „	<i>P. canorufa</i> , Walk.	
♀ „	<i>P. illecta</i> , Walk.	

The larva feeds on *Cercopsis* (Grote).

THALPOPHILA	CUPREA, Moore.	Andamans. N.E. Bengal. S. India.
-------------	----------------	----------------------------------

*Family* **Caradrinidæ.**

AMYNA	SELENAMPHA, Guen.	Silhet. Andamans. Java. Ceylon.
<i>Alumis spoliata</i> , Walk.		
CARADRINA	PAUCHIFERA, Walk.	Burma.
„	ORBICULARIA, Wich.	Burma.
„	ARENACEA, Moore.	Darjiling.
„	DELECTA, Moore.	Darjiling.
ACOSMETIA	NEBULOSA, Moore.	Darjiling.

*Family* **Gortynidæ.**

GORTYNA	CUPREA, Moore.	Darjiling.
HYDRECIA	NAXIACOIDES, Moore.	Bengal.

*Family* **Xylophasiidæ.**

XYLOPHASIA	FLAVISTIGMA, Moore.	Bengal.
„	LEUCOSTIGMA, Moore.	Bengal.

SASUNAGA TENEBROSA, Moore.	Darjiling.
NELURIA SIMULATA, Moore.	Darjiling.
APAMEA CUPRINA, Moore.	Sikkim.
„ MUCRONATA, Moore.	Darjiling.
„ STRIGIDISCA, Moore.	Darjiling.
„ NUBILA, Moore.	Darjiling.

*Family Dipterygiidæ.*

DIPTERYGIA INDICA, Moore.	Darjiling.
SPODOPTERA CHILUM, Guen.	Andamans. Bengal.
„ <i>S. insulsa</i> , Walk.	
„ NUBES, Guen.	Bengal. Andamans. Java.
PRODENIA CHLIGERA, Guen.	Andamans. Java. Bengal.
„ <i>P. glaucistriga</i> , Walk.	
The larva very destructive to cabbages (Grote).	
„ DECLINATA, Walk.	Burma.
„ INFECTA, Walk.	Bengal.
„ <i>P. insignata</i> , Walk.	
„ LECTULA, Walk.	Bengal.
CALOGRAMMA FESTIVA, Don.	Bengal.
„ <i>C. picta</i> , Guen.	

The larva feeds on *Crinum* and *Liliaceous* plants (Grote).

*Family Glottulidæ.*

POLYTELA GLORIOSÆ, Fabr.	
GLOTTULA DOMINICA, Cram.	Bengal. Burma.
The larva feeds on <i>Crinum paneratum</i> , <i>Zephyranthus</i> , etc. (Blyth).	
RAMADASA PAVO, Walk.	Andamans. Ceylon.
CHASMINA CYGNUS, Walk.	Bengal.

*Family Leucaniidæ.*

MYTHIMNA CERVINA, Moore.	Bengal.
LEUCANIA EXTRANEÆ, Guen.	Calcutta.
„ EXSANGUIS, Guen.	Silhet.
„ CONFUSA, Walk.	Bengal.
„ EXTERIOR, Walk.	Bengal.
„ DESIGNATA, Walk.	Bengal.
„ VENALBA, Moore.	Bengal.
„ PULCHERRIMA, Moore.	Darjiling.
„ DECISSIMA, Walk.	Darjiling.
„ COSTALIS, Moore.	Andamans.
„ PROSCRIPTA, Walk.	Burma.
„ BISTRIGATA, Moore.	Darjiling.
„ MODESTA, Moore.	Darjiling.
„ BIVITTATA, Walker.	Burma.
„ SEJUNCTA, Walker.	Burma.
„ LINEATIPES, Moore.	Cherra.
„ ADUSTA, Moore.	Darjiling. Khasi hills.
„ CONSIMILIS, Moore.	Darjiling.
„ CORUPTA, Moore.	Padda R.
„ ALBISTIGMA, Moore.	Darjiling.
„ HOWRA, Moore.	Calcutta.
„ ABDOMINALIS, Moore.	Bengal.
„ DHARMA, Moore.	Darjiling.

LEUCANIA ALBICOSTA, Moore.	Darjiling.	
„ PROMINENS, Moore.	Darjiling.	Cherra.
ALBIA DISTINCTA, Moore.	Darjiling.	
BOROLIA FASCIATA, Moore.	Darjiling.	
SIMYRA CONSPERSA, Moore.	Calcutta.	
NONAGRIA IRREGULARIS, Walker.		
ESCHATA GELIDA, Walker.	Burma.	
TYMPANISTES PALLIDA, Moore.	Darjiling.	
„ TESTACEA, Moore.	Darjiling.	
AUCHMIS SIKKIMENSIS, Moore.	Darjiling.	

*Family* **Bryophilidæ.**

BRIOPHILA ALBOSTIGMA, Moore.	Bengal.
------------------------------	---------

*Family* **Bombycoidæ.**

DIPHTERA ATROVIRENS, Walk.	Darjiling.
„ NIGROVIRIDIS, Walk.	Darjiling.
„ PRASINA, Walk.	Darjiling.
„ VIGENS, Walk.	Darjiling.
„ PALLIDA, Moore.	Bengal.
„ DISCIBRUNNEA, Moore.	Bengal.
ACRONYCTA PRUINOSA, Guen.	Silhet.
„ FLAVULA, Moore.	Bengal.
„ INDICA, Moore.	Bengal.
GAURENA FLORENS, Walk.	Darjiling.
„ FLORESCENS, Walk.	Darjiling.

*Family* **Cymatophoridæ.**

GONOPHORA INDICA, Moore.	Bengal.
OSICA UNULATA, Moore.	Bengal.
THYATIRA BATH, L.	Bengal.
„ DECORATA, Moore.	Darjiling.
RISOBA OBSTRUCTA, Moore.	Calcutta.
„ PROMINENS, Moore.	Khasi hills.
KERALA PUNCTILINEATA, Moore.	Darjiling.
SARONAGA ALBICOSTA, Moore.	Darjiling.
PALIMPSESTIS ALTERNATA, Moore.	Darjiling.
„ CUPRINA, Moore.	Darjiling.

Tribe SPHINGES.

*Family* **Hepialidæ.**

PHASSUS SIGNIFER, Walk.	Bengal.
„ CHALYBEATUS, Moore.	Darjiling.
„ DAMOR, Moore.	Darjiling.
„ ABOE, Moore.	Darjiling.
HEPIALUS NIFALENIS, Steph.	Darjiling.
„ SEX-NOTATUS, Moore.	Darjiling.

*Family* **Cossidæ.**

COSSUS CADAMBE, Atkinson.	Bengal.
The larva bores into the wood of <i>Nauclea cadamba</i> .	
ZEUZERA MINEUS, Cram.	

ZEUZERA INDICA, Boisd.	
„ LUCONOTA, Steph.	Calcutta.
„ CONFERTA, Walk.	Silhet.
„ PAUCIPUNCTATA, Walk.	Silhet.
„ MULTISTRIGATA, Moore.	Darjiling.

*Family Lasiocampidæ.*

LEBEDA FLAGIFERA, Walk.	Bengal. Java.
„ NANDA, Moore.	Darjiling.
„ NUDANS, Walk.	Silhet.
„ LATIPENNIS, Walk.	Calcutta.

The larva feeds on *Nyctanthus arbortristis* and *Lagerstrœmia indica* (Grote).

„ FERRUGINEA, Walk.	Silhet.
„ <i>L. ampla</i> , Walk.	
„ NOBILIS, Walk.	Silhet.
„ BUDDHA, Lefebvre.	Bengal. Canara. Java.
„ <i>L. plagiala</i> , Walk.	
„ REPANDA, Walk.	
„ VINATA, Moore.	Darjiling.
MUSTILIA FALCIPENNIS, Walk.	Darjiling.
ESTIGENA PARDALE, Walk.	
BHARLETTA CINNAMOMEA, Moore.	Darjiling.
ANDRACA BIPUNCTATA, Walk.	Darjiling.
„ TRILCHOIDES, Moore.	Darjiling.
GANGARIDES ROSA, Moore.	Darjiling.
„ DHARMA, Moore.	Bengal.
TRABALA LETA, Walk.	Bengal.
„ MAHANUNDA, Moore.	Bengal.
ARBELA TESSALATA, Moore.	Darjiling.
„ VISHNU, Lefebvre.	Darjiling. Java.
<i>Amydoma prasina</i> , Walk.	
„ <i>pallida</i> , Walk.	
„ <i>basalis</i> , Walk.	

The larva feeds on the Castor oil plant (*Ricinus communis*), the Sal tree (*Shorea robusta*) and the Pomegranate (*Punica granatum*).

AFONA PALLIDA, Walk.	Darjiling.
TARAGAMA GANESA, Lefebvre.	Bengal. Canara. Java.
<i>Bombyx Siva</i> , Lef.	
<i>Megasoma albicans</i> , Walk.	
„ <i>venustum</i> , Walk.	

The larva feeds on *Hyperanthera moringa* (Grote).

SUANA BIMACULATA, Walk.	Bengal. Ceylon. Java.
<i>Lebeda concolor</i> , Walk.	

The larva feeds on a species of *Psidium*.

ALOPRA FERRUGINEA, Moore.	Darjiling.
BRAHMLEA CERTHIA, Fab.	Sikkim.
<i>Bombyx Wallichii</i> , Gray.	
„ <i>spectabilis</i> , Hope.	
„ WHITEI, Butler.	Sikkim.
KOSALA SANGUINEA, Moore.	Khasi hills.
LASCIOCAMPA VIITATA, Walk.	Bengal.
ODONESTIS BHEROBA, Moore.	Darjiling.
POECILOCAMPA UNDULOSA.	Sikkim.
MURLIDA LINEOSA, Walk.	

Family **Limacodidæ.**

SCOPELODES UNICOLOR, Westw.	Bengal.
„ VILNOSA, Walk.	Silhet.
MIRESA ALBIPUNCTA, H. Schœff.	Darjiling.
„ CASTANEIPARS, Moore.	Darjiling.
CANDYRA PUNCTATA, Walk.	Central India. Bengal.
„ <i>Belyora subnotata</i> , Walk.	
LIMACODES RETRACTATA, Walk.	Darjiling.
„ APICALIS, Walk.	Silhet.
TRISULA VARIEGATA, Moore.	Bengal.
The larva feeds on <i>Ficus religiosa</i> .	
MIRESA BREVILINTA, Walk.	Darjiling.
CHILENA SIMILIS, Walk.	
NYSSIA HERBIFERA, Walk.	
„ LATIFASCIA, Walk.	
PARASA LEPIDA, Cram.	Bengal.
<i>Limacodes graciosa</i> , Westw.	
The larva feeds on <i>Eugenia</i> and <i>Mangifera</i> (Grote).	
„ PINICA, Boisl.	Silhet.
„ ISABELLA, Moore.	Bengal.
The larva feeds on <i>Shorea robusta</i> .	
„ LULEANA, Moore.	Calcutta.
The larva feeds on <i>Amora rohituka</i> , <i>Irora longiflora</i> and <i>Mussenda frondosa</i> (Grote).	
„ NARARIA, Moore.	Calcutta.
The larva feeds on a species of <i>Crescentia</i> .	
„ UNICOLOR, Moore.	Calcutta.
The larva feeds on <i>Ochna squamosa</i> (Grote).	

The larvæ of this genus construct their cocoon in the form of a hard smooth oval capsule, affixed to the trunks of mango and other trees, opening at one end by a circular lid or segment. The larvæ are bright coloured and armed with spines, which simulate the adornments of some forms of marine nudibranchiate mollusks. Many (if not all) of them are armed with poisonous organs capable of producing severe pain, and perhaps even dangerous results. Dr. Templeton describes the larva of *P. lepida* as “stinging with such horrible pain, that I sat in the room almost sick with it, and unable to keep the tears from running down my cheeks for more than two hours, applying ammonia all the time.”

I have myself suffered severely from my ignorance of the powers of this handsome caterpillar, and believe that the stinging organs are extremely short black hairs, which are arranged as four velvet-black spots on its posterior extremity, which spots on examination are found to be *brushes* (so to speak) of closely packed hairs. On entering into the chrysalis state these hairs are disposed loosely round the mouth of the cocoon, and retained there by a flimsy web, and doubtless serve as an efficient protection against prying intruders. Examining one of these freshly formed capsules, I got some of these minute hairs on my fingers, where they attracted no notice, but incautiously drawing my fingers across my nose, I was almost prostrated by the sufferings which their contact with a sensitive mucous membrane gave rise to. The effect was a violent running at the nose and eyes, pain in the frontal region, and great irritation and inflammation of the fauces and throat. These symptoms lasted some hours, and I can quite imagine that fatal results might accrue to a child or weakly person, if badly stung. The larvæ of this genus are polyphagous, attacking the leaves of the most diverse plants and trees, e.g. *Eugenia*, *Mangifera*, *Ricinus*, *Ochna*, *Crescentia*, *Bambusa*, *Shorea*, *Annona squamosa*, *Pyrus*, etc.



## Family Saturniidae.

RINACA ZULEIKA, Hope.	Darjiling.
CALIGULA CACHARA, Moore.	N. Cachar.
CRICULA TRIFENESTRATA, Hoffer.	Martaban.
SATURNIA ZULEIKA, Westw.	

The larva feeds on the leaves of *Anacardium orientale*, *Protium Javanum*, *Canarium commune*, etc.

CRICULA DREPANOIDES, Moore.	Darjiling.
SALASSA LOLA, Westw.	Silhet.
ACTIAS IGNESESCENS, Moore.	Andamans.
„ SELENE, MacLeay.	Andamans.

This moth is recorded by Mr. F. Moore from Port Blair, a most remarkable habitat of a moth, which in the Himalayas is found at from 5000 to 7000 feet. It is not a similar case with insects recorded from "Darjiling," which occur also in Burma, as it is a matter of notoriety that the bulk of Darjiling collections are made in the low, hot and humid valleys. The transformations of this species have been graphically described by Hutton (Trans. Ent. Soc. Lond. iv. p. 221, id. v. pp. 45, 85), who found the larva feeding on *Coriaria Nipalensis*, *Andromeda oralifolia*, *Juglans regia*, and (?) on *Carpinus binana*. The moth, when about to issue from the cocoon, ejects from the mouth a few drops of clear, colourless fluid, using a tuft of down between the eyes as a brush for the application of the solvent. When the fibres are thus sufficiently moistened, it thrusts the point of its wing-spine or 'wing-spur' (as Hutton names it) through the cocoon, drawing the cutting edge across the fibres, until severed sufficiently to enable the moth to come forth.

„ MEXAS, Doubl.	Silhet.
„ LETO, Doubl.	Darjiling.
„ ANDAMANA, Moore.	Andamans.

The Andaman 'Tusser' silk moth.

The genus *Antheræa* yields the well-known 'Tusser' silk, and several species, as yet not fully discriminated, occur throughout India. The Andaman race, or species, has been separated by Moore, but whether it is identical with that on the mainland is uncertain. For an interesting account (too long to extract here) of silk, sericulture, and the various silk-yielding moths, reference may be made to Balfour's Cyclopædia of India, though the value of that work is lamentably marred by the authorities for the various statements in the text being quoted collectively at the end of each article, instead of individually with reference to particular facts or allegations.

Besides silk, the silk-worm yields the material known to fishermen as 'gut,' which is the dried 'silk-vessel.' The largest caterpillars are selected, and killed by being plunged into strong vinegar, in which they are allowed to remain about twelve hours, when the two silk reservoirs are removed and stretched on a board and dried in the sun. It is worth inquiry if this article could not be largely prepared from many species of caterpillars which do not yield a silk in sufficient quantity or of a sufficiently good quality to render them worth domestication; in which case a new industry might be opened up in a hitherto neglected channel.

SATURNIA GROTEI, Moore.	Darjiling.
„ ANNA, Atkinson.	Darjiling.
„ GUERINI, Moore.	Bengal.
„ IOLE, Westw.	Assam.
„ PYRETORUM, Westw.	Bengal.
„ CIDOSA, Moore.	Darjiling.
„ LINDIA, Moore.	Bengal.
ANTHERÆA FRITHI, Moore.	Darjiling.
„ HELFERI, Moore.	Darjiling.
„ ASSAMA, Helfer.	Assam.
„ MIRANDA, Atkinson.	Bengal.

ANTHIEREA ROYLEI, Moore.	Darjiling.
„ SIMLA, Westw.	Darjiling (?).
„ PAPHIA, L.	Bengal. Silhet. Assam. Ceylon. Java.

The Tussock silk moth, *Manga* of the Meohis, *Kolisurra* of the Deccan.

The Tussock larva feeds on *Zizyphus jujuba*, *Terminothia alata*, *glabra* and *catappa*, *Bombar heptaphyllum*, *Shorea robusta*, etc. A plain species, not ranging into the higher hills.

ATTACUS ATLAS, L.	Silhet. Java.
„ EDWARDSII, White.	Darjiling.
„ GUERINI, Moore.	Bengal.
„ RICINI, Jones.	Assam. N.E. Bengal. Ceylon.
<i>Sat. arrundi</i> , Milne-Edw.	
<i>Attacus houlia</i> , Walk.	

The Eria silk moth.

The larva feeds on the *Ricinus* or Castor oil plant, and is domesticated in Malta, Piedmont, Tripoli, France, etc. "The cocoons are remarkably soft and white or yellowish, the filament so exceedingly delicate as to render it impracticable to wind off the silk, it is therefore spun like cotton. The yarn when manufactured is woven into a coarse kind of white cloth of a seemingly loose texture, but of incredible durability, the life of one person being seldom sufficient to wear out a garment made of it" (Roxburgh, Trans. Lin. Soc. 1804). The winding difficulty has been since overcome (Journ. Agri.-Hort. Soc. of India, Vol. II. part ii. p. 61).

„ CYNTHIA, Drury.	Assam. Bengal. Java. China.
-------------------	-----------------------------

The 'Eria' silk moth of Assam.

This species is domesticated in China, and the larva feeds on *Ailanthus glandulosa*. This and the last species have been very often confounded, a remark however which is applicable to many other silk moths, and it is not now precisely known what wild species are indigenous in Burma.

#### Family Drepanulidæ.

ORETA EXTENSA, Walk.	Bengal. Java.
„ <i>O. suffusa</i> , Walk.	
„ OBTUSA, Walk.	Silhet.
„ PAVACA, Moore.	Darjiling.
„ VATAMA, Moore.	Darjiling.
DUPANA DUPLEXA, Moore.	Darjiling.
„ PATRANA, Moore.	Darjiling.
„ VIRA, Moore.	Darjiling.
„ SADANA, Moore.	Darjiling.
LOEPA KATINKA, Westw.	Bengal. Java.
„ SIKKIMA, Atkinson.	Sikkim.

#### Family Bombycidæ.

TRILOCHA VARIANS, Moore.	Bengal. Canara.
ARISTHALA SIKKIMA, Moore.	Darjiling.
BOMBYX MORI, L.	

The domestication of this insect dates from the earliest abyss of history, being popularly ascribed in Chinese archives (according to Horsfield) to Se-ling-she, the wife of the Chinese Emperor Hwangté, who lived some 2640 years before Christ. How little the ancients knew of the origin of this material we learn from Virgil, who supposed it to be a vegetable product like cotton.

"Quid tibi odorato referam sudantia ligno  
Balsamaque, et baccas semper frondentis acanthi?  
Quid nemora Æthiopum, molli canentia lana?  
Velleraque ut foliis depectant tenuia Seres?" *Georg. II.* 118.

The *B. mori* has been found wild in England by the Rev. W. Fox feeding on (among other plants the common bramble, *Rubus fruticosus* *vide* Athenæum, October 16, 1858), but it may be fairly surmised that the larvæ in question were the brood of an escaped female.

BOMBAX RELIGIOSA, Helfer. Assam.

The Joroe or Deo-mooga silkworm.

The larva feeds on *Ficus religiosa*.

„ TEXTOR, Hutton.

The Boro-pooloo silkworm.

„ CRÆSI, Hutton.

The Nistry, or Madras silkworm.

„ FORTUNATUS, Hutton.

The 'dasee' ('common') silkworm.

„ SIXENSIS, Hutton.

The China silkworm.

THEOPHILA BENGALENSIS, Hutton. Calcutta.

The larva feeds on *Artocarpus lacucha* (Grote).

„ SHERWILLII, Moore.

OCINARIA LAUTEA, Hutton.

#### Family Notodontidæ.

THIACIDAS POSTICA, Walk. Bengal. Canara.

*Drymonia denotata*, Walk.

*Cnethocampa cruvata*, Walk.

STAUROPUS SIKKIMENSIS, Moore.

„ INDICES, Moore.

„ VIRESCENS, Moore.

DAMATA LONGIPENNIS, Walk.

CULEIA PLUSIATA, Walk.

„ AURITRACTA, Moore.

MENAPIA KAMADENA, Moore.

CERURA LITURATA, Walk.

„ PRASANA, Moore.

„ DAMODARA, Moore.

HEPHEROCAMPA SIKKIMA, Moore.

„ ARGENTIFERA, Moore.

ICHTHYURA FERRUGINEA, Moore.

„ INDICA, Moore.

The larva feeds on *Placourtia cataphracta* (Grote).

„ FULGURITA, Walk.

NOTODONTA BASALIS, Moore.

PARAVITTA DISCINOFA, Moore.

LOPHOPTERYX SATURATA, Walk.

ANODONTA PULCHERRIMA, Moore.

ANTHENA DISCALIS, Walk.

The larva feeds on a species of *Hedysarum*.

ANTICYRA COMBUSTA, Walk.

*Dinara linota*, Walk.

The larva feeds on a species of *Saccharum*.

PHALERA RAYA, Moore.

„ PARIVALA, Moore.

PHALERA TINEBROSA, Moore.	Darjiling.
„ GROTEI, Moore.	Bengal.
The larva feeds on <i>Cesalpinia</i> and <i>Cassia fistula</i> (Grote).	
„ SANGANA, Moore.	Darjiling.
„ COSSOIDES, Walk.	Silhet.
NERICE PALLIDA, Walk.	Bengal.
APELA DIVISA, Walk.	Bengal.
GARGETTA COSTIGERA.	Darjiling.
SYBRIDA INORDINATA, Walk.	Darjiling.
DIDUSA SPHINGIFORMIS, Moore.	Sikkim.
SPHETTA APICALIS, Moore.	Darjiling.
GLUPHISIA SINUATA, Moore.	N.E. Bengal.
RACHIA PLUMOSA, Moore.	Darjiling.

#### Family Arctiidæ.

ALPHENUS BISERIATUS, Moore.	Andamans.
ALOPE OCELLIFERA, Walk.	Bengal. Canara.
ALPHEA FULVOURTA, Walk.	Darjiling.
„ ABDOMINALIS, Moore.	Darjiling.
HYPERCOMPA MULTIGUTTATA, Walk.	Darjiling.
„ EQUITALIS, Kollar.	Darjiling.
„ PLAGIATA, Walk.	Darjiling.
„ LONGIPENNIS, Walk.	Silhet.
„ IMPLETA, Walk.	Bengal.
„ IMPERIALIS, Walk.	Bengal.
CREATONOTUS INTERRUPTA, L.	Bengal. Pinang. Java. Ceylon.
„ EMITTENS, Walk.	Bengal. Canara.
RAJENDRA VITTATA, Moore.	Darjiling. Burma.
GLANYCUS INSOLITUS, Walk.	Silhet.
ALVA LACINEA, Cram.	Bengal.
<i>Bombyx sanguinea</i> , Fabr.	
AMERILA ASTRÆA, Drury.	Bengal.
ARCTIA IMBUTA, Walk.	Bengal.
PHISSIMA TRANSIENS, Walk.	Bengal. Pinang.
AREAS ORIENTALIS, Walk.	Darjiling. Java.
SPILSOMA MULTIVITTATA, Moore.	Darjiling.
„ RHODOPHILA, Walk.	Bengal.
„ RUBIDORSA, Moore.	Darjiling.
„ SORDIDA, Moore.	Darjiling.
„ RUBITINCTA, Moore.	Darjiling.
„ NIGRIFRONS, Walk.	Darjiling.
„ FLAVALIS, Moore.	Darjiling.
„ LATIVITTA, Moore.	Darjiling.
„ STIGMATA, Moore.	Darjiling.
„ SANGUINALIS, Moore.	Darjiling.
„ RUBILINEA, Moore.	Darjiling.
„ DISCINIGRA, Moore.	Darjiling.
„ DENTILINEA, Moore.	Sikkim.
„ GOPARA, Moore.	Darjiling.
„ SUFFUSA, Walk.	Darjiling.
„ PUNCTATA, Moore.	Darjiling.

#### Family Zygenidæ.

EPRESSA AFFINIS, Moore.	Andamans.
EUCHROMIA POLYMENA, L.	Andamans.

*Family Psychidæ.*

MAHASENA ANDAMANA, Moore.	Andamans.
CRYPTOTHELLA CONSORIA, Templeton.	Bengal.

*Family Liparidæ.*

RILDOA FLAVESCENS, Moore.	Andamans.
„ SERICEA, Moore.	Andamans.
„ CLARA, Walk.	Bengal.
„ ARGENTEA, Walk.	Darjiling.
<i>Dasychira ilita</i> , Moore.	
„ SUBIDA, Walk.	Bengal.
<i>Leucoma subnitra</i> , Walk.	
„ CYGNA, Moore.	N.E. Bengal.
PROCODECA ANGULIFERA, Walk.	Bengal. Java.
<i>Ricine suffusa</i> , Walk.	
PSALIS SECURIS, Hübn.	Bengal.
<i>Arctha antica</i> , Walk. ♂	
<i>Rigema falcata</i> , Walk. ♀	
„ <i>falcatella</i> , Walk. ♀	
<i>Anticgra approximata</i> , Walk. ♀	

The larva feeds on *Oryza sativa* (rice).

NAXA TEXTILIS, Walk.	Bengal.
GENUSA CIRCUMDATA, Walk.	Bengal.
AROA PYRRHOCHROMA, Walk.	Bengal.
OROGYIA PLANA, Walk.	Bengal.
„ ALBIFASCIA, Walk.	Bengal.
„ SUBFASCIA, Moore.	Darjiling.
DASYCHIRA ANTICA, Walk.	Bengal.
„ COMPLICATA, Walk.	Darjiling.
<i>Trisula pustulifera</i> , Walk.	
„ TENEBROSA, Walk.	Darjiling.
„ RHANA, Moore.	Darjiling.
„ FLAVIMACULA, Moore.	Darjiling.
HEKACULA DISCIVITTA, Moore.	Darjiling.
MARDARA CALLIGRAMMA, Walk.	Bengal.
SOMERA VIRIDIFUSCA, Walk.	Bengal.
LYMANTRIA OBSOLETA, Walk.	Balasar.
„ <i>blaseara</i> , Moore. ♀	
„ SUPERANS, Walk.	Bengal.
„ SIMILIS, Moore.	Calcutta.
„ CONCOLOR, Walk.	Bengal.
„ GRANDIS, Walk.	Bengal.
„ SEMICINCTA, Walk.	Ranceganj.
„ BASINIGRA, Moore.	Balasar.
„ MATHURA, Moore.	N.E. Bengal.
CAVIRA CYGNA, Moore.	Andamans.
LELIA VENOSA, Moore.	Andamans.
EUPROCTIS SUBNIGRA, Moore.	Cherra.
„ POSTINCISA, Moore.	N.E. Bengal.
„ DISCINOTA, Moore.	Andamans.
„ VIRGUNCULA, Walk.	Bengal. Java.

The larva feeds on *Conyza balsamifera* and *Dioscorea oppositifolia*.

„ DIVISA, Walk.	Bengal.
„ LUTESCENS, Walk.	Bengal.
„ ATOMARIA, Walk.	Bengal.

EUPROCTIS PARUTA, Walk.	Darjiling.
„ RANA, Moore.	Silhet.
„ RIGUTA, Walk.	Canara. Java.
NUMENES INSIGNIS, Moore.	Silhet. Darjiling. Java.
„ <i>Silvetti</i> , Walk.	
„ PATRANA, Moore.	Butan.
LEUCOMA LATIFASCIA, Walk.	Bengal.
„ <i>Euproctis melanophila</i> , Walk.	
ARTANA VARIANS, Walk.	Tenasserim. China.
„ INCONGUA, Walk.	Bengal.
„ UNIMACULA, Moore.	Khasi Hills.
„ BREVIIVITTA, Moore.	Bengal.
„ HOWRA, Moore.	Calcutta.
DRLATA FUNDATA, Bland.	Bengal. Madras.
„ <i>undifera</i> , Walk.	
„ MUTANS, Walk.	Darjiling.
„ CITRINA, Walk.	Bengal. Dakhan.
„ TAGOLNSIS, Moore.	Tenasserim.
ALPATA REGALIS, Moore.	Tenasserim.
JANA LIMPIDA, Walk.	Darjiling.
„ CERVINA, Moore.	Darjiling.
TAGORA GLAUDESCENS, Walk.	Darjiling.
„ PANDYA, Moore.	N.E. Bengal.
GANISA PLANA, Walk.	Bengal.
The larva feeds on <i>Jasminum</i> .	
PERINA BASALIS, Walk.	Tenasserim.
„ <i>Euproctis antica</i> , Walk. ♂ var d.	

#### Family Chalcosiidæ.

HISTIA FLABELLICORNIS, Fabr.	Darjiling.
„ PAPILLIONARIA, Grér.	Darjiling.
RETINA RUBRIVITTA, Walker.	Tenasserim.
CYCLOSLIA NIGRESCENS, Moore.	Andamans.
„ SANGUIFLUA, Drury.	Butan. Cherra.
„ MIDAMA, Boisd.	Cherra.
„ <i>C. venusta</i> , Walk.	
„ PAPILLIONARIS, Drury.	Darjiling. Java.
EPICOPPEIA VARUNEÆ, Moore.	Darjiling.
„ PHILOXENÆA, Moore.	Darjiling.
„ DIPHILEA, Moore.	Darjiling.
ERASMA PULCHELLA, Hope.	Darjiling. Cherra.
PHILOPATOR BASIMACULATA, Moore.	Darjiling.
CHELURA GLACIALIS, Moore.	Darjiling.
„ BIFASCIATA, Hope.	Bengal. (Nipal.)
„ BASIFLAVA, Moore.	Darjiling.
MILIONIA LATIVITTA, Moore.	Sikkim.
„ ZONEA, Moore.	N.E. Bengal.
CHATAMBA FLAVESCENS, Moore.	Khasi Hills.
„ NIGRESCENS, Moore.	Darjiling.
CADPHISES MACULATA, Moore.	Darjiling.
CHALCOSIA PECTINICORNIS, L.	Butan.
„ CORUSCA, Boisd.	Silhet.
„ <i>C. zuleika</i> , Walk.	
LAURION GEMINA, Walk.	Bengal. Java.
„ CIRCE, Boisd.	Cherra.
PIDORUS GLAUCCOPIS, Drury.	Darjiling.

SCAPTESYLE TRICOLOR, Walk.	
EITERUSIA TRICOLOR, Hope.	Cherra. Pinang.
ADEA, L.	Silhet. Ceylon.
SCINTILLANS, Boisd.	Silhet.
<i>E. sublutca</i> , Walk.	
EBOCLA, Doubl.	Silhet.
FULCHELLA, Walk.	Darjiling.
CIRCINATA, Boisd.	Bengal.
SEX-PUNCTATA, Walk.	Bengal.
FERREA, Walk.	Bengal.
SHAHAMA, Moore.	Darjiling.
CANTERKES EUSCHEMIDES, Moore.	Silhet.
PHALANNA POLYMENA, L.	Andamans. Darjiling. Calcutta.
The larva feeds on <i>Convolvulus</i> .	
RATARDA MARMORATA, Moore.	Darjiling.
THYMARA CAUDATA, Moore.	Burma and Paukabari.
SYNTOMIS ANDERSONI, Moore.	Yunan.
SLADENI, Moore.	Yunan. Tenasserim.
ATKINSONI, Moore.	Yunan. Tenasserim.
FYCHEI, Moore.	Yunan.
GROTEI, Moore.	Yunan. Tenasserim.
MASONI, Moore.	Tenasserim.
LIBERA, Walker.	Tenasserim.
BISKUTTA, Moore.	Tenasserim.
VERNIDA, Moore.	Tenasserim.
ALBIFRONS, Moore.	Tenasserim.
DIAPHANA, Kollar.	Bengal.
CREUSA, L.	Bengal. Ceylon.
MULTIGUTTA, Walk.	Darjiling.
SCHLENERKII, Boisd.	Darjiling.
SUBCORDATA, Walk.	Bengal.
Larva feeds on <i>Vitis pallida</i> (Grote).	
HUBNERI, Boisd.	
PENANGA, Moore.	Pinang.
PTEROTHYSANUS LATICILIA, Walk.	Darjiling.

*Family Euschemidæ.*

EUSCHEMA MILITARIS, L.	Tenasserim. Darjiling. Java.
EXCUBITOR, Moore.	Tenasserim.
AURILIMBATA, Moore.	Tenasserim.
HORSFIELDII, Moore.	Tenasserim.
ANDAMANA, Moore.	Andamans.
ROEPSTORFFI, Moore.	Andamans.
CELERENA ANDAMANA, Feld.	Andamans.

*Family Nyctemeridæ.*

NYCTEMERA LATISTRIGA, Walk.	Tenasserim. Java. Canara.
LACTICINIA, Cram.	Andamans. Java. Ceylon.
The larva feeds on <i>Cuculia conchifolia</i> .	
VARIANS, Walk.	Darjiling.
MACULOSA, Walk.	
CFNIS, Cram.	Darjiling. Cherra.
PTIASILA MOOLAIKA, Moore.	Tenasserim.
LEUCOSPILOIA, Moore.	Andamans.

Family **Lithosiidæ.**

## HYPSINÆ.

"All the genera in this sub-family possess a peculiar stridulatory apparatus in both sexes. This is distinctly visible on the upper side of the posterior margin of the fore-wing, and as viewed from the *under side* of the wing appears as a short oval, nacreous cavity, situated between the submedian vein and the extreme margin, along the upper edge of which projects a raised longitudinally oblique fold, which is smooth in some, and transversely scabrous in others; and on the *upper side* of the hind wing is a patch of scabrous scales or a short transverse outwardly-curved raised scabrous bar, which, by the motion of this wing, evidently plays upon the raised fold over the edge of the cavity and produces a stridulating sound" (Moore, P. Z. S. 1878, p. 3).

<i>HYPSA</i> <i>ALCIPHON</i> .	Tenasserim. Andamans. Java.
„ <i>VENALBA</i> , Moore.	Andamans.
„ <i>SUBSIMILIS</i> , Walk.	Tenasserim.
„ <i>ANDAMANA</i> , Moore.	Andamans.
„ <i>PLAGINOTA</i> , Butler.	Tenasserim.
„ <i>CARULE</i> , Fabr.	Bengal.
„ <i>IGENS</i> , Walk.	Butan. Pinang.
„ <i>FIGUS</i> , Fabr.	Bengal. Canara.
„ <i>HELICONIA</i> , L.	Bengal.
„ <i>PLANA</i> , Walker.	Darjiling.

The larvæ of this genus feed on a species of *Ficus*.

<i>DIGAMA</i> <i>FIGURATA</i> , Moore.	Burma.
„ <i>HEARSEYANA</i> , Moore.	Bengal.
<i>Scydra</i> <i>halesidotalis</i> , Walk.	
<i>CALPENIA</i> <i>KHASIANA</i> , Moore.	Khasi Hills.

## LITHOSINÆ.

<i>MACROBROCHIS</i> <i>GIGAS</i> , Walk.	Cherra.
„ <i>LEUCOSPILOTA</i> , Moore.	Assam. Cherra.
<i>TRIPURA</i> <i>PRASENA</i> .	Bengal.
<i>SIDYMA</i> <i>APICALIS</i> , Moore.	Darjiling.
<i>CHURINGA</i> <i>RUBRIFRONS</i> , Moore.	Darjiling.
<i>VAMUNA</i> <i>REMALANA</i> , Moore.	Darjiling.
„ <i>MACULATA</i> , Moore.	Darjiling.
„ <i>BIPARS</i> , Moore.	Darjiling.
<i>MAHAVIRA</i> <i>FLAVICOLLIS</i> , Moore.	Darjiling.
<i>KORAMA</i> <i>PALLIDA</i> , Moore.	Darjiling.
<i>HESUDRA</i> <i>DIVISA</i> , Moore.	Darjiling.
<i>GHORIA</i> <i>ALBOCINEREA</i> , Moore.	Darjiling.
„ <i>SERICEIPENNIS</i> , Moore.	Darjiling.
<i>CHRYSEGLIA</i> <i>MAGNIFICA</i> , Walk.	Bengal. Borneo.
„ <i>FERRIFASCIATA</i> , Moore.	Darjiling.
<i>GEONISTIS</i> <i>ENTELLA</i> , Cram.	Tenasserim.
<i>LITHOSIA</i> <i>DISJUNCTA</i> , Moore.	Darjiling.
<i>SIMAREA</i> <i>BASINOTA</i> , Moore.	Darjiling.
<i>TARIKA</i> <i>VARANA</i> , Moore.	Darjiling.
„ <i>NIVEA</i> , Walk.	Darjiling.
<i>BRUNIA</i> <i>ANTICA</i> , Walk.	Andamans. Ceylon.
<i>GANDHARA</i> <i>SERVA</i> , Walk.	Darjiling.
<i>COLLITA</i> <i>LILACINA</i> , Moore.	Yunan.
„ <i>PARVA</i> , Moore.	Darjiling.
<i>KATHA</i> <i>CUCULLATA</i> , Moore.	Andamans.
„ <i>INTERMITTA</i> , Walk.	Andamans.
„ <i>TERMINALIS</i> , Moore.	Darjiling.
<i>SYSTIOPHIA</i> <i>DORSALIS</i> , Moore.	Darjiling.



CHRYSORABDIA VIRIDATA, Walk.	Darjiling.
CAPISSA VAGESA, Moore.	Darjiling. Khasi Hills.
„ PALLENS, Moore.	Darjiling.
DOLGOMA RETICULATA, Moore.	Darjiling.
„ ANGULIFERA, Feld.	Darjiling.
„ BRUNNEA, Moore.	Darjiling.
MITHUNA QUADRIPLAGA, Moore.	Darjiling.
COSSA QUADRISIGNATA, Moore.	Darjiling.
„ BRUNNEA, Moore.	Darjiling.
„ NUBECULA, Moore.	Andamans.
RANGHANA PUNCTATA, Moore.	Calcutta.
TEGULATA PROLIFERANS, Moore.	Darjiling.
NISHADA FLABRIFERA, Moore.	Calcutta.
TEULISNA TENUISIGNA, Moore.	Sikkim.
ZADADRA DISTORTA, Moore.	Darjiling.
PRABHASA VENOSA, Moore.	Darjiling.
„ FLAVICOSTA, Moore.	Cherra.
BIZONE COCCINEA, Moore.	Sikkim.
„ PERORNATA, Walk.	
„ GUTTIPIRA, Walk.	
„ <i>B. fasciculata</i> , Walk.	
„ DIVAKARA, Moore.	Darjiling.
„ ARAMA, Moore.	Darjiling.
„ AMABILIS, Moore.	Andamans. Nicobars.
BARSINE GLORIOSA, Moore.	Khasi Hills.
„ PUNICEA, Moore.	Darjiling.
„ INFLEXA, Moore.	Darjiling.
„ FLAVIVENOSA, Moore.	Darjiling.
„ TRIVITTATA, Moore.	Andamans.
„ DEFECTA, Walk.	Darjiling.
„ NUBIFASCIA, Walk.	
ARGINA ASTREA, Drury.	Andamans. Nicobars. Java. Butan.
<i>A. cribraria</i> , Cram.	
„ DULCIS, Walk.	Bengal. Canara.
„ ARGUS, Kollar.	Darjiling. Java.
„ SYRINGA, Cram.	Bengal.
LYCENE ARTOCARPI.	Darjiling.
Larva feeds on <i>Artocarpus incisa</i> (Grote).	
„ RADIANUS, Moore.	Darjiling.
„ DELICATA, Moore.	Darjiling.
„ PROMINENS, Moore.	Cherra.
„ ZEBRINA, Moore.	Calcutta.
„ PALMATA, Moore.	N.E. Bengal.
„ INTERSERTA, Moore.	Darjiling.
„ OBSOLETA, Moore.	Darjiling.
„ DISCISTRIGA, Moore.	Darjiling.
„ TERMINATA, G. Austen.	Khasi Hills.
„ ASSAMICA, Atkinson.	Assam.
„ INDISTINCTA, Moore.	Darjiling.
ÆMENE MACULIFASCIA, Moore.	Darjiling.
„ SINUATA, Moore.	Cherra.
SETINA DISCISIGNA, Moore.	Cherra.
„ NEBULOSA, Moore.	Darjiling.
SETINOCHROA AURANTIACA, Moore.	Khasi Hills.
NUDARIA FASCIATA, Moore.	Darjiling.
CASTABALA ROSEATA, Walk.	Bengal.
UIETHESIA PULCHELLA, L.	Darjiling. Java.

<i>VITHILIA FICATA</i> , Walk.	Martaban.
<i>VITHISSA SURADEVA</i> , Moore.	Bengal.
<i>GROTHA FUGANS</i> , Moore.	N.E. Bengal.
<i>ANAGNIA SUBVASCATA</i> , Walk.	Tenasserim.
„ <i>ORICULARIS</i> , Walk.	Cherra. Java.

The cocoon is covered with particles of leaves and lichens.

<i>TINOLLUS FURNIGUTIA</i> , Walk.	
<i>CISPIA PUNCTIFASCIA</i> , Walk.	
„ <i>VINOSA</i> , Walk.	
<i>SISAPA ANDAMANA</i> , Moore.	Andamans.
<i>EPILOCIA MEMPHARIA</i> , Cham.	Andamans. Java.
<i>NUCHTRA MARMORATA</i> , Walk.	Tenasserim.
<i>PHILOXA CINERASCENS</i> , Moore.	Andamans.

Of the moths forming his tribe *Bombyces*, Horsfield observes: "The next tribe comprises those forms which undergo their metamorphosis in a covering, constructed by its occupant, and popularly designated a '*cocoon*.' This covering is a characteristic distinction of the whole tribe, and has in each species a peculiar form, which is reproduced instinctively with unvarying uniformity."

#### Family *Ægeriidae*.

<i>MILITIA BOMBYLIFORMIS</i> , Chamber.	Tenasserim. Bengal. Java.
„ <i>EURYION</i> , Westw.	Bengal. Java.

#### Family *Agaristidae*.

<i>SENDARA VINOSA</i> , Moore.	Darjiling.
<i>VITHORA INDRASANA</i> , Moore.	N.E. Bengal.
<i>ÆGOCERA VENTILIA</i> , Cham.	Bengal.
<i>EUSEMIA MACULATRIX</i> , Westw.	Darjiling.
„ <i>ALBOMARGINATA</i> , Moore.	Andamans.
„ <i>DENTATRIX</i> , Westw.	Darjiling.
„ <i>ADULATRIX</i> , Kollar.	Darjiling.
„ <i>E. bellatrix</i> , Westw.	
„ <i>VICTRIX</i> , Westw.	Darjiling. Cherra.
„ <i>FUNEBRIS</i> , Moore.	Darjiling.
<i>PHLEGORISTA TRANSIENS</i> , Walk.	Darjiling. Java.
<i>P. catocaloides</i> .	
„ <i>LONGIPENNIS</i> , Walk.	Darjiling.
„ <i>BAIA</i> , Moore.	Darjiling.
<i>NYCTALEMON PATROCLUS</i> , L.	Arakan. Assam.

Of the Atlas moth Dr. Mason says: "The Atlas moth is one of the largest insects of the moth tribe known. The smallest specimens I have seen measured from eight to nine inches in the expanse of its wings, which were pencilled with the richest amber, brown and yellow, and bordered with magnificent ocelli. This moth belongs to the silkworm family, and until recently was known to entomologists only as a native of China; but it also abounds in Burma. This is probably the insect which Mr. Blyth had from Rangoon, of which he wrote: "A well-known moth from Burma. *Phalena patroclus*; a splendid species common in collections from China, Assam, Silhet, and Aracan."

„ <i>NAJABULA</i> , Moore.	Andamans.
----------------------------	-----------

#### Family *Callidulidae*.

<i>CLEOSIRIS CATAMITA</i> , Hübn.	Andamans. Java.
<i>CALLIDULA PETAVIA</i> , Cham.	Bengal. Martaban. Java.

<i>LOPHURA HYAS</i> , Boisd.	Java. Bengal.
The larva feeds on a species of <i>Paderia</i> .	
„ <i>FUSILLA</i> , Walk.	Silhet.
<i>SALASIES INTERNATUS</i> , Westw.	Silhet.
<i>SISIA HYLAS</i> , L.	Martaban. Darjiling. Pinang.
<i>ACOSMERYA CINEREA</i> , Butler.	Silhet.
<i>CHLOROCAMPA NEXUS</i> , Drury.	Andamans.
The larva feeds on <i>Dioscorea oppositifolia</i> .	
„ <i>CLOTHO</i> , Drury.	Tenasserim. Java.
„ <i>TINIBROSA</i> , Moore.	Andamans.
„ <i>MAJOR</i> , Butler.	Silhet.
„ <i>CLERID</i> , L.	Bengal. Java.
„ <i>ATICTO</i> , L.	Darjiling. Java.
„ <i>THYLIA</i> , L.	Bengal. Java.
„ <i>LINFOSA</i> , Walk.	Darjiling.
„ <i>LEUCSI</i> , Boisd.	Bengal. Java. Canara.
„ <i>LYCEIUS</i> , Cram.	Bengal.
„ <i>BISECTA</i> , Hobs.	Bengal. Java.
„ <i>C. Silhetensis</i> , Walk.	
<i>TRITOGON ANDAMANA</i> , Moore.	Andamans.
<i>CLANIS PHALARIS</i> , Cramer.	Andamans. Nicobars.
„ <i>C. Nicobarensis</i> , Hubn.	
<i>CALAMNIA PAVONICA</i> , Moore.	Andamans.
<i>MACROGLOSSA ORIENTALIS</i> , Butler.	Tenasserim. Yunnan.
„ <i>SITHENE</i> , Boisd.	Martaban. Bengal.
„ <i>LETHATA</i> , Butler.	Tenasserim. Silhet.
„ <i>PASSALUS</i> , Drury.	Bengal. Java. Canara.
„ <i>CORYMBUS</i> , Boisd.	Darjiling. Java. Canara.
„ <i>GYRANS</i> , Boisd.	Bengal.
„ <i>INTERRUPTA</i> , Butler.	Darjiling.
„ <i>HELMICROMA</i> , Butler.	Silhet.

### Family Sphingidæ.

<i>TRITOGON DRYAS</i> , Boisd.	Darjiling. Java.
„ <i>EGGAS</i> , Butler.	Silhet.
„ <i>DECORATUS</i> , Moore.	Sikkim.
„ <i>DENTATUS</i> , Cram.	Bengal. Java.
The larva feeds on <i>Saccharum cylindricum</i> .	
„ <i>CRISTATUS</i> , Butler.	Darjiling.
„ <i>SILHETENSIS</i> , Butler.	Silhet.
„ <i>ITSCESCENS</i> , Butler.	Darjiling.
„ <i>SPECTABILIS</i> , Butler.	Darjiling.
<i>LEUCOPHLEBIA LINEATA</i> , Westw.	Bengal.
<i>BASIANA CLAVATA</i> , Walk.	Bengal.
„ <i>SUPERBA</i> , Moore.	Darjiling.
<i>AMBULYX SUBSTRIGILIS</i> , Westw.	Tenasserim. Java. Canara.
„ <i>LITURATA</i> , Butler.	
The larva feeds on <i>Amoora rohikata</i> .	
„ <i>RHODOPTERA</i> , Butler.	Darjiling.
„ <i>TURBATA</i> , Butler.	Darjiling.
<i>ACHEILIONIA SATANAS</i> , Boisd.	Andamans. Silhet. Java.
„ <i>A. Morta</i> , Hubn.	
„ <i>A. Lethe</i> , Westw.	
The larva feeds on the Tobacco plant.	

ACHLEONTHA STYX, Westw.	Bengal. Madras. Pinang. Java.
„ LACHESIS, Fabr.	
SPHINX CONVOLVULI, L.	Andamans.
<i>Protoparce Orientalis</i> , Butler.	
The larva feeds on <i>Phaseolus max.</i>	
MACROSILA DISCISTRIGA, Walker.	Tenasserim. Java. Canara.
„ NYCTIPHANES, Boisd.	Silhet.
ZONILIA MORPHILUS, Cram.	Bengal. Ceylon.
<i>Perigonia obliterans</i> , Walk.	
LAUGIA KHASIANA, Moore.	Khasi Hills.
PANACRA ELLA, Butler.	Silhet.
„ BUSIRIS, Boisd.	Tenasserim. Andamans.
„ VIGIL, Guér.	Bengal. Ceylon.
„ <i>P. lignaria</i> , Walk.	
„ AUTOMEDON, Boisd.	Silhet.
PHILANPELUS ANCEUS, Cram.	Bengal. Java. Pinang.
„ NAGA, Moore.	Darjiling.
DARAPSA BHAGA, Moore.	Bengal.
DAPHNIS NERI, L.	Bengal.
The larva feeds on a species of <i>Nerium</i> .	
PERGESIA ACTEUS, Cram.	Tenasserim. Andamans. Java.
The larva feeds on a species of <i>Arum</i> .	
„ CASTOR, Boisd.	Darjiling.
„ DOLICHOIDES, Feld.	Sikkim.
„ EGROTA, Butler.	Silhet.
„ GLORIOSA, Butler.	Darjiling.

## RHOPALOCERA.

Antennæ, with few exceptions, clubbed or terminating bluntly. Diurnal. In the Hesperidæ they are hooked at the tip. In the *Lycanidæ*, *Erycinidæ*, and *Nymphalidæ* the fore-legs are rudimentary, this peculiarity in the two former being confined to the males.

Family **Hesperidæ**  
(including *Pterygaspidae*).

GONILOBA CHROMUS, Cramcr.	Andamans. Bengal. Java.
„ RAVI, Moore.	Andamans. Pinang. Nankowri.
„ BADRA, Moore.	Bengal. Java.
„ SENA, Moore.	Darjiling. Java.
„ FOLUS, Cram.	Bengal. Java.
„ MENAKA, Moore.	Darjiling. Ranjit Valley.
„ PRALAYA, Moore.	Tenasserim. Java. Bengal.
„ GANA, Moore.	Bengal. Java.
TAGIADES ALICA, Moore.	Andamans.
„ HELFERI, Feld.	Nicobars.
„ DASAHARA, Moore.	Ranjit Valley.
„ MEETANA, Moore.	Tenasserim.
SATARUPA GOPALA, Moore.	Darjiling.
„ SAMBARA, Moore.	Darjiling.
„ BHAGAYA, Moore.	Bengal.
DARPA HANKIA, Moore.	Bengal.
ISMENE BENJAMINI, Guér.	Tenasserim. Darjiling. Ranjit Valley.
<i>II. xanthopogon</i> , Kellar.	
„ MAHINTHA, Moore.	Burma.
„ MALAYANA, Feld.	Andamans.

ISMENE ARIA, Moore.	Andamans. Bengal.
„ LERUDEA, Hew.	Andamans.
„ JAINA, Moore.	Bengal. Darjiling.
„ VASUTANA, Moore.	Darjiling.
„ HARISA, Moore.	Darjiling.
„ AMARA, Moore.	Darjiling. Ranjit Valley.
„ GONIATA, Moore.	Bengal.
„ MURDARA, Moore.	Darjiling.
„ DRUNA, Moore.	Tenasserim. Andamans. Bengal.
„ SASSIVARNA, Moore.	Bengal.
„ LABON, Moore.	N. India. Java.
CALLIANA PTERIDOIDES, Moore.	N.E. Bengal.
CAPITA JAYADIVA.	Darjiling.
PISOLA ZENNARA, Moore.	Bengal.
ACHYLODES SURA, Moore.	Bengal.
„ VASARA, Moore.	Darjiling.
PLESIONEURA SUMITRA, Moore.	Bengal. Ranjit Valley.

Very swift in its flight, and always alights with expanded wings, and has the habit of executing an aerial patrol up and down a small space (Nicéville).

„ PULOMAYA, Moore.	Darjiling.
„ AMBAREESA, Moore.	Bengal.
„ CHAMUNDA, Moore.	Bengal.
„ PUTRA, Moore.	Bengal. Java.
„ ALYSOS, Boisd.	Andamans. Bengal. Java.
„ BHANADA, Moore.	Bengal.
„ DAX, Fabr.	Bengal. Darjiling. Java.
„ <i>Hes. fatih</i> , Kollar.	
„ INDRANI, Moore.	Darjiling.
„ PRABA, Moore.	Bengal. Java.
„ HELFERI, Feld.	Nicobars.
„ AURIVITTATA, Moore.	Tenasserim.
„ ALBIFASCIATA, Moore.	Tenasserim.
„ LILIANA, Atkinson.	Yunan.
HESPERIA THRAX, L.	Darjiling. Java.

The larva feeds on *Musa paradisiaca*.

„ SEMANORA, Moore.	Bengal. Sikkim.
„ DIVODASA, Moore.	Bengal. Canara.

The larva feeds on a species of *Phenic*.

„ CHAYA, Moore.	Yunan. Darjiling. Java.
-----------------	-------------------------

Ranges to 8000 feet (Nicéville).

„ AQUA, Moore.	Bengal. Java.
„ MANGALA, Moore.	Bengal. Pinang.
„ ELTOLA, Hew.	Yunan. Kurseong.
„ MOOLATA, Moore.	Tenasserim.
„ BEAVANI, Moore.	Tenasserim.
„ CAHIRA, Moore.	Andamans.
„ MATTHIAS, Fabr.	Tenasserim. Nicobars.
„ FARRI, Moore.	Cherra. Calcutta.
„ OCEIA, Hew.	Andamans.
„ TOONA, Moore.	N.E. Bengal.
„ COLACA, Moore.	Andamans. Nicobars.
„ THYRSIS, Fabr.	Andamans. Nicobars.
„ <i>H. pandia</i> , Moore.	

ISOETINON SUBFESTACEUS, Moore.	Tenasserim.
--------------------------------	-------------

ISOEINON ATKINSONI, Moore.	Darjiling.
„ KHASIANUS, Moore.	Khasi Hills.
ASTICOPTERUS OLIVASCENS, Moore.	Martaban. Darjiling.
CYCLOPIDES SUBVITTATUS, Moore.	Martaban. Darjiling.
„ SUBRADIATUS, Moore.	Khasi Hills.
THANOS INDISTINCTA, Moore.	Martaban.
„ OBSOLITA, Moore.	Cherra. Assam.
PITHAURIA MURDARA, Moore.	Darjiling.
HALPE BETURIA, Hew.	Andamans. Calcutta.
„ DOLOPIA, Hew.	Darjiling.
PAMPHILA SIVA, Moore.	Khasi Hills
„ SUBOCHRACEA, Moore.	Calcutta.
„ BAMBUS.E, Moore.	Tenasserim. Calcutta.
„ MASONI, Moore.	Tenasserim.
„ MESODES, Butler.	Andamans.
„ MESA, Moore.	Yunan.
„ PURKEA, Moore.	Andamans.
„ GOLA, Moore.	Andamans.
„ OLIVASCENS, Moore.	Tenasserim.
„ SUBVITTATUS, Moore.	Tenasserim.
„ SAGARA, Moore.	Bengal.
„ ANGAS, L.	Java.
„ PALMARUM, Moore.	Calcutta and Nicobars.
„ VEDANGA, Moore.	Butan. Java.
PYRGUS SUPERNA, Moore.	Bengal.
„ DANNA, Moore.	Butan.

#### Family *Lycænidae*.

PITHECOPS HYLAX, Fabr.	Tenasserim. Andamans. Java.
POLYOMMATUS PUSPA, Horsf.	Yunan. Java.
„ KASHMIRA, Moore.	Yunan.
„ CHANDALA, Moore.	Yunan.
„ SANGRA, Moore.	Andamans and Kamorta.
„ VARUNANA, Moore.	
„ KANDURA, Moore.	
„ LAIUS, Cram.	Calcutta.
The larva feeds on <i>Zizyphus</i> (Atkinson).	
„ KARSANDRA, Moore.	Kamorta ( <i>vide</i> Cadell).
„ TRANSPECTUS, Moore.	Khasi Hills. E. Bengal.
„ DILECTUS, Moore.	Sikkim. N. Cashar.
LYCÆNA ROSIMON, Fabr.	Silhet. Java. Nankowri.
„ KANDARPA, Horsf.	Tenasserim. Java.
„ ELPIS, Godart.	Andamans. Tenasserim. Java.
„ PLUTO, Fab.	N. India. Java.
„ <i>L. Nila</i> , Horsf.	
var. <i>Nicobarica</i> .	Nicobars.
„ PANDAVA, Horsf.	Nicobars. Andamans.
„ ROXUS, Godt.	Tenasserim. Java.
„ PSEUDO-ROXUS, Doubl.	Silhet.
„ BÆTICA, L.	N. India. Java.
„ PLINUS, Fabr.	N. India. Java.
„ THEOPHRASTUS, Fabr.	
„ CNEJUS, Fabr.	Nicobars. Java.
„ ALEXIS, Stoll	Tenasserim. Andamans. Nicobars.
<i>Hesperia Ælianus</i> , Fabr.	

Larva feeds on the *Butea frondosa*.

LYCENA ARDATES, Moore.	Andamans.
„ PACIOLUS.	Andamans.
„ STRABO, Fabr.	Andamans and Nicobars.
„ KINKURKA, Feld.	Nicobars.
„ KANKUNA, Feld.	Nicobars.
„ KONDLANA, Feld.	Nicobars.
„ PARRHASIUS, Fabr.	Nicobars.
„ MACROPHALMA, Feld.	Nicobars.
„ PLUMBO-MICANS, Wood-Mason.	Andamans.
var. <i>Nicobarica</i> .	Nicobars.
„ EATHON, Hew.	Andamans.
„ ELVA, Hew.	Andamans.
„ MANLUENA, Feld.	Nicobars.
CHRYSOPHANUS PHILEAS, L. (28).	Darjiling.
<i>Pap. virgaurea</i> , Scop.	
„ TIMLEUS, Cram.	Bengal.
ILLERDA MOOREI, Hew.	Bengal.
„ EPICLES, God.	Darjiling.
„ BRAHMA, Moore.	Darjiling.
„ TAMU, Kollar.	Darjiling.
„ ANDROOLES, Boisd.	Darjiling.
LYCENESTHES BENGALENSIS, Moore.	
DIPSAS (including <i>Denderis</i> ).	
„ VARUNA, Horsf.	Andamans.
„ MELAMPUS, Cramer.	Calcutta. Java.
„ EPIJARRAS, Boisd.	Andamans. Darjiling.
„ SUFFESA, Moore.	Andamans.
„ ORSEUS, Hew.	Nicobars.
„ DILNECES, Hew.	Andamans.
„ SYLA, Kollar.	Darjiling.
„ ISOCRATES, Fabr.	Darjiling.
„ NISSA, Kollar.	
„ TIMOLEON, Stoll.	Java.
<i>Amb. rochanu</i> , Horsf.	
„ PERSE, Hew.	
„ RECTIVITTA, Moore.	N. Cachar.
„ SHISTACEA, Moore.	Calcutta.

The larva of a species of this genus (*D. Isocrates*, Fabr.) commits great havoc among Pomegranates, and is an especially interesting object of study from the unusual method of procedure adopted by it. According to Mr. Charles King, several larvæ reside in the interior of the same fruit, and before undergoing their metamorphosis, which takes place in the interior, each caterpillar perforates the rind, and in concert with its co-occupants, weaves a strong silken band with the purpose of attaching the fruit firmly to its stalk and preventing its being blown off and coming to the ground. Mr. E. T. Downes, however, was unsuccessful in verifying the interesting observations of Mr. King, as the larvæ, which he surrounded with gauze in order to watch them in the process of weaving the band connecting the fruit with the stalk, declined to re-enter the fruit, and actually underwent their metamorphosis on the outside of it (*vide* Horsfield, Catalogue, p. 36).

AMBLYPODIA LONGINUS, Fabr.	Bengal.
„ PSEUDOLONGINUS, Doubl.	Maulmain. Java.
The larva feeds on a <i>Loranthus</i> .	
„ VIDURA, Horsf.	Tenasserim. Java.
„ CAMDEO, Doubl.	Tenasserim. Darjiling.
„ QUERCETORUM, Boisd.	Yunan. Silhet.
„ CLEOMIS, God.	
„ <i>hyapatada</i> , Moore.	

AMBLYPODIA	TIMOLEON, Stoll.	Butan.
"	<i>Iyca</i> , Doubl.	
"	NARADA, Horsf.	Java.
"	RAMA, Kollar.	Darjiling.
"	AMERIA, Hew.	
"	DEVA, Moore.	
"	ABSENS, Hew.	
"	ARESTE, Hew.	Darjiling.
"	FULGIDA, Feld.	
"	ATRAK, Hew.	
"	SILHETENSIS, Boisd.	Silhet.
"	AMANTES, Hew.	
"	PERIMUTA, Boisd.	Silhet.
"	CHINENSIS, Feld.	Darjiling.
"	EUMOLPUS, Cram.	Java. Bengal.
"	CENTACEUS, Fabr.	Darjiling.
"	<i>A. nakula</i> , Feld.	
CAMENACTESIA, Hew.		
POBITIA HEWITSONI, Moore.		
APHYLUS LOBITA, Horsf.		Java.
var. <i>Zoilus</i> , Moore.		Andamans.
"	ANTIARBAS, Boisd.	
"	LEOLUS, Cram.	Bengal. Java.
"	SYAMA, Horsf.	Java.
"	ICTIS, Hew.	Calcutta.
"	LUNULIFERA, Moore.	Darjiling.
HYPOLICENA OTHONA, Hew.		
"	AMASA, Hew.	Martaban.
<i>P. etolus</i> , Fabr.		
"	ERYLUS, Fabr.	Andamans.
"	ANDAMANA, Moore.	Andamans.
NARATHURA MOOLAIANA, Moore.		Tenasserim.
<i>Amblypodia epimuta</i> Hew. (non Moore).		
MYRINA LAPITHES, Boisd.		Martaban.
"	SUGRIVA, Horsf.	Martaban. Java.
var. <i>areca</i> , Feld.		Nicobars.
"	THECLOIDES, Feld.	Nicobars. Singapore.
"	KAMORTA, Feld.	Nicobars.
"	WESTERMANNII, Feld.	Andamans.
"	TARTINA, Hew.	Andamans.
"	LISIAS, Fabr.	Martaban. Tenasserim.
"	JAFRA, God.	Yunan. Tenasserim. Java.
"	PRABHA, Moore.	Andamans.
"	FREJA, Fabr.	Tenasserim.
"	HYPATULA, Boisd.	Martaban.
"	ELTOLA, Hew.	Andamans.
"	ACTE, Doubl.	Bengal.
"	TRIOPAS, Cram.	Calcutta.
"	JALINDRA, Horsf.	Balacor.
"	<i>S. thymbræus</i> , Hübn.	
"	MANDARINA, Doubl.	
"	JANGALA, Horsf.	Darjiling. Java.
"	RAVATA, Moore.	Bengal.
"	ONYX, Boisd.	Darjiling.
LOXURA ATYMNUS, Cram.		Tenasserim. Nankowri. Java.
"	TRIPUNCTATA, Hew.	Bengal.
CURETIS DUCALIS, Moore.		Darjiling.
"	SARONIS, Moore.	Andamans. Tenasserim.



ANOPS STIGMATA, Moore.	Tenasserim.
„ THELYS, Drury. ♀	Martaban. Nicobars. Canara.
<i>Pap. cingra</i> , Cram. ♂	
„ BULIS, Boisd.	Martaban. Darjiling.
MILETUS SYMETHUS, Cram.	Tenasserim.
„ BOISDUVALI, Moore.	Darjiling.
„ BRUMILA, Moore.	Bengal.

*Family Erycinidæ.*

ZEMEROS FLEGYAS, Cram.	Tenasserim. Yunan.
TANILA FYLLA, Boisd.	Yunan.
„ NEOPHRON, Boisd.	Yunan. Tenasserim.
„ ECHERUS, Stoll.	Martaban.
„ ANGULATA, Moore.	Tenasserim.
DODONA DIFRÆA, Hew.	Bengal.
„ EGEON, Boisd.	Bengal.
„ ADONIRA, Hew.	Bengal.
„ OCIDA, Hew.	Bengal.
<i>Tacila Erato</i> , Boisd.	
„ DEODATA, Hew.	Maulmain.
„ LONGICAUDATA, L. de Nicéville.	Assam.
ABISARA KAUSAMBI, Feld.	Andamans. Java. Sumatra.
„ BIFASCIATA, Moore.	Andamans and Nicobars.

*Family Satyridæ.*

DEBIS CHANDICA, Moore.	Yunan. Darjiling. Java.
„ DYRPE, Feld.	Yunan.
„ LATIARIS, Hew.	Yunan.
„ SINORIX, Hew.	Bengal.
„ ROHRIA, Fabr.	Tenasserim. Yunan. Java.
„ <i>D. isana</i> , Kollar.	
„ VERNA, Koll.	Tenasserim. Yunan. Darjiling.
„ EUROPA, Fabr.	Yunan. Andamans. Java.
„ MEKARA, Moore.	Tenasserim. Darjiling.
„ ARCADIA, Cram.	Tenasserim. Java.
„ VISRAVA, Moore.	
„ NEILGHERRIENSIS, Guérin.	Darjiling.
„ SIDONIS, Hew.	
„ NICETAS, Hew.	
„ BHAIRAVA, Moore.	Darjiling.
„ SCANDA, Moore, ♂	Darjiling.
„ NADA, Moore, ♀	Darjiling.
„ KANSA, Moore.	Darjiling.
ZOPHOESSA SURA, Doubl. et Hew.	Darjiling.
„ GOALPAPA, Moore.	
„ BALADEVA, Moore.	
„ YAMA, Moore.	Butan.
„ ANDERSONI, Atkinson.	Yunan.
CALLEREBIA ORIXA, Moore.	Khasi Hills.
SATYRUS AVATARA, Moore.	
„ SWAHA, Kollar.	Darjiling.
LASIOMMATA SATRICUS, Doubl. et Hew.	
„ SCHIRAKRA, Kollar.	Darjiling.
NEOPE PULANA, Moore.	Yunan. Butan.
„ BHADRA, Moore.	Darjiling.
„ BHIMA, Marshall.	Tenasserim.

ZETHERA DIADEMOIDES, Moore.	Tenasserim.
ERITES ANGULARIS, Moore.	Tenasserim.
ZUPHÆTES SCYLAX, Hew.	
ETHIOPE HIMACHALA, Moore.	
<i>Nörina Seta</i> , Feld.	
<i>Tisiphone Seta</i> , Boisd.	
MYCALESIS MINEUS, L.	Tenasserim. Andamans.
„ PERSEUS, Fabr.	Tenasserim.
„ BLASIUS, Fabr.	Tenasserim.
„ MEDUS, Fabr.	Nicobars.
„ PRUSIA, Cram.	Nicobars. Andamans. Darjiling.
„ SAMBA, Moore.	Andamans. Yunan.
„ <i>M. lulasis</i> , Hew.	
„ ANAXIAS, Hew.	Tenasserim.
„ OTREA, Cram.	Yunan. Andamans. Java. Butan.
„ RENEKA, Moore.	Yunan. Tenasserim. Assam.
„ FRANCISCA, Cram.	Assam.
„ MALSARA, Moore.	Yunan. Darjiling.
„ NALA, Feld.	Yunan.
„ SANATANA, Moore.	Darjiling.
„ RADZA, Moore.	Andamans.
„ HESIONE, Cram.	Java. N. India.
„ VISALA, Moore.	Darjiling.
„ NICOTIA, Hew.	
„ HERI, Moore.	Butan.
„ KHASIANA, Moore.	Khasi Hills.
„ CHARAKA, Moore.	N.E. Bengal.
ELYMNIAS LAIS, Boisd.	Martaban. Bengal.
„ MIMUS, Wood-Mason et Léon. de Nic.	
„ UNDULARIS, Boisd.	Martaban.
Larva feeds on the <i>Corypha umbraculifera</i> .	
„ COTTONIS, Hew.	Andamans.
„ TINCTORIA, Moore.	Tenasserim.
„ VASTUDEVYA, Moore.	Tenasserim.
„ LEUCOCYMA, Godt.	Tenasserim.
CYLAPA MNASICLES, Hew.	Tenasserim.
YPHTHIMA LYSANDRA, Cram.	Java. Darjiling.
„ PHILOMELA, Hübn.	
„ BALDUS, Fab.	
„ METHORA, Hew.	Yunan. Tenasserim.
„ HYAGRIYA, Moore.	Darjiling.
„ NIWARA, Moore.	Yunan.
„ NARASINGHA, Moore.	Darjiling.
„ SAKRA, Moore.	Darjiling.
MELANITIS UNDULARIS, Fabr.	Bengal.
„ VASUDEVYA, Moore.	Silhet.
„ MALELAS, Hew.	Bengal.
„ PATNA, Westw. et Hew.	Bengal.
CYLLO LEDA, L.	Tenasserim. Darjiling. Andamans.
„ CONSTANTIA, Cram.	Darjiling.
„ BANKSIA, Fabr.	Tenasserim. Yunan. Darjiling.
<i>M. Ismene</i> , Cram.	
„ VAMANA, Moore.	Yunan. Darjiling.
„ BELA, Moore.	Tenasserim. Darjiling.
„ ASWA, Moore.	
„ SURADEVA, Moore.	Darjiling.
ORINOMA DAMARIS, Gray.	Yunan. Darjiling.

Family **Libytheidæ.**

LIBYTHEA MYRRHA, Godt.	Tenasserim.
„ LEPTA, Moore.	

Family **Nymphalidæ.**

VANESSA KASHMIRENSIS, Kollar.	Butan.
„ CHARONTA, Drury.	
SYMBRENTHIA NIPHADA, Moore.	Sikkim.
PYRAMEIS CARDUI, L.	Andamans. Kamorta. Darjiling. Java.

The larva feeds on a species of *Artemisia*.

„ INDICA, Herbst.	
„ CALLIRHOE, Hubn.	Pinang. Darjiling.
JUNONIA ORITHYIA, L.	Yunan. Tenasserim. Java. Butan.

The larva feeds on a species of *Vitex*.

„ LAOMEDIA, L.	Yunan. Tenasserim. Nicobars.
----------------	------------------------------

The larva feeds on a species of *Achyranthis*.

„ LEMONIAS, L.	Yunan. Tenasserim. Assam.
„ ALMANA, L.	Yunan. Tenasserim. Andamans.
„ ASTERIE, L.	Yunan. Andamans. Java.
var. <i>Nicobariensis</i> .	Kar Nicobar.

The larva feeds on a species of *Justicia*.

„ CENONE, L.	Yunan. Andamans.
„ NICOBARIENSIS, Feld.	Nicobars.
PRECIS IMITA, Cram.	Yunan. Andamans. Tenasserim.
„ HARA, Moore.	Yunan. Silhet.
„ VEDA, Kollar.	

A water-loving insect flying along a regular beat, up and down the beds of streams, occasionally settling on a leaf, but darting off in pursuit of any intruder. It is a very wary insect, and not easy to capture unless waited for in the line of its flight, when a quick stroke of the net may secure it (Nicéville).

ERGOLIS CORYTEA, Cram.	Assam. Java.
„ ARIADNE, L.	Yunan. Tenasserim. Darjiling.
CYNTHIA ARSINOE, Cram.	Martaban. Darjiling. Java.
„ EROTA, Fabr.	Andamans.
EURYTELA HORSFIELDII, Boisd.	Andamans.
AMATHUSIA PHIDIFFUS, L.	Tenasserim. Andamans.

The larva feeds on the young leaves of *Cocos nucifera*.

CYRESTIS THYODAMAS, Boisd.	Tenasserim. Andamans. Darjiling.
„ RISA, Doubl.	Tenasserim. Darjiling.

This species, as well as *C. Thyodamas*, has the habit of suddenly settling with wings wide outspread on the *under side* of a leaf parallel to the ground, where it is completely hidden. This feat of gymnastics is confined to this genus alone, as far as my experience goes, and must be a great protection to it from its enemies. The disappearance of the insect is so rapid, that unless one has actually watched it settle on the leaf, it seems like magic (Nicéville).

„ COCLES, Fabr.	Tenasserim. Andamans.
„ FORMOSA, Feld.	Andamans.
PARTHENOS GAMBRISIUS, Fabr.	Tenasserim. Andamans. Pinang.
„ APICALIS, Moore.	Tenasserim.
PROTHOE FRANKII, Godt.	Tenasserim. Java.
CIRROCHROA SURYA, Moore.	Tenasserim.
„ AORIS, Doubl. et Hew.	Yunan. Darjiling.

CERLOCHROA MITHILA, Moore.	Yunan. Bengal.
„ ANJIRA, Moore.	Andamans.
„ NICOBARICA, Wood-Mason et Léon, de Nic.	Nicobars.
CUTHOSIA CYANE, Fabr.	Yunan. Darjiling.
„ BIBLIS, Drury.	Yunan. Darjiling.
„ NICOBARICA, Feld.	Andamans. Nicobars.

The larva of some species of this genus feeds on the *Passion-flower*.

ARGYNNIS NITHE, L.	Yunan. Darjiling. Pinang.
„ RUPIKA, Moore.	Yunan.
„ CHILDRENI, G. R. Gray.	Yunan.
„ ISS-IA, Gray.	Butan.
MESSARAS ERYMANTHIS, Drury.	Tenasserim. Nicobars. Java.
„ NICOBARICA, Feld.	Andamans. Nicobars.
„ ALCIPE, Cram.	Andamans. Silhet. Borneo.
ATELLA PHALANTA, Drury.	Yunan. Java.

The larva feeds on a species of *Leora*.

„ EGISTA, Cram.	Java. Tenasserim. N. India.
„ SINHA, Kollar.	Bengal.
„ ALCIPE, Doubl.	Katschall Island. Andamans.
LAOGONA HYPOCLIS, Cram.	Yunan. Darjiling. Java.
„ HYPOCLIS, Godt.	Bengal.
DIADEMA BOLINA, L.	Yunan. Andamans. Java.
„ MISIPPUS, L.	Nicobars.
„ AUGÉ, Cram.	Andamans. Nicobars. Java.
„ <i>D. Jacintha</i> , Fabr.	
PENTHEMA LISARDA, Doubl. et Hew.	Darjiling.
„ DARLISA, Moore.	Tenasserim.
„ BINGHAMI, Wood-Mason.	Martaban.
HESTERIA NAMA, Doubl. et Hew.	Yunan. Darjiling.
„ PERSIMILIS, Westw.	Yunan. Darjiling.
EURIPUS NYCTELICUS, Doubl.	
„ CONSIMILIS, West.	Martaban.
„ HALIROTHIUS, Westw.	Darjiling.
„ HALITHERSES, Doubl. et Hew.	Yunan. Darjiling.
„ ISA, Moore.	Darjiling.
„ <i>E. haliartus</i> , Feld.	
LEBADEA ATTENUATA, Moore.	Tenasserim.
„ AUSTENIA, Moore.	Khasi Hills.
NEPTIS CNACALIS, Hew.	Andamans.
„ NICOBARICA, Moore.	Nicobars.
„ ANANTA, Moore.	Yunan.
„ NAXDINA, Moore.	Yunan. Darjiling. Java.
„ HORDONIA, Stoll.	Yunan. Java. Siliguri.
„ EMODES, Moore.	Yunan. Sikkim. Khasi Hills.
„ MIAM, Moore.	Darjiling.
„ AMBA, Moore.	Yunan.
„ ACERIS, Esper.	Darjiling. Java.
„ SOMA, Moore.	Yunan. Silhet. Tenasserim.
„ VIKASI, Horsf.	Darjiling.
„ MANANDA, Moore.	Andamans and Kar Nicobar.
„ COLUMELLA, Cram.	Darjiling. Ceylon.
„ ANDAMANA, Moore.	Andamans.
„ MEITAN, Moore.	Tenasserim.
„ JAMBAN, Moore.	Tenasserim. Darjiling. Ceylon.
„ MATUTA, Hübn.	Nankowri Island.
„ ADIFALA, Moore.	Tenasserim. Khasi Hills.

NEPTIS FLAGIOSA, Moore.	Tenasserim.
„ RUDHA, Moore.	Butan.
„ OPHIANA, Moore.	Sikkim.
„ KAMARUPA, Moore.	Assam.
„ KHASIANA, Moore.	Khasi Hills.
„ HARITA, Moore.	E. Bengal.
„ CLINTA, Moore.	Bengal.
„ VIRAJA, Moore.	N.E. Bengal.
„ SUSRUTA, Moore.	Siliguri.
APHYMA ZEROCA, Moore.	Khasi Hills.
„ LEUCOTHOE, L.	Yunan. Darjiling. Java.
„ NEPTE, Cram.	Tenasserim.
„ SELENOPHORA, Koll.	Yunan. Andamans. Darjiling.
„ OPALINA, Kollar.	Darjiling.
„ CAMA, Moore.	Yunan. Darjiling.
„ CIBARITIS, Hew.	Andamans and Nankowri Island.
„ RANGA, Moore.	Darjiling.
„ JAHNI, Moore.	Tenasserim. Darjiling.
„ CHEYANA, Moore.	
„ ACONTIUS, Hew.	Andamans.
„ SUBRATA, Moore.	
„ TADIANA, Moore.	Tenasserim.
„ RAHULA, Moore.	
„ EVELINA, Stoll.	Tenasserim.
„ MAHESA, Moore.	Darjiling.
„ COCYTUS, Fabr.	Tenasserim.
„ ZEROCA, Moore.	Khasi Hills.
„ EPIONA, G. R. Gray.	
„ <i>Doubledayi</i> , Boisd.	
„ JINA, Moore.	Darjiling.
„ INARA, Doubl. et Hew.	Darjiling.

The males of this genus are especially fond of settling in damp spots to suck up the moisture.

SYMBRENTHIA COTANDA, Moore.	Darjiling.
„ KHASIANA, Moore.	Khasi Hills.
ABKOTA GANGA, Moore.	Darjiling.
<i>Adelius confinis</i> , Feld. ♀	
„ JUMNA, Moore.	Darjiling.
LIMENITIS DARAXA, Doubl.	Yunan. Darjiling.
„ PROCRIS, Cram.	Tenasserim. Java. Bengal.
var. <i>anarta</i> , Moore.	Andamans.

The larva feeds on a species of *Nauclea*.

„ ZULEMA, Doubl. et Hew.	Darjiling.
„ ISMENE, Doubl. et Hew.	Sillcet.
„ ZAYLA, Doubl. et Hew.	Darjiling.
„ DANAVA, Moore.	
„ DUDU, Westw. et Hew.	Darjiling.
HERONA ANGUSTATA, Moore.	Tenasserim.
„ MARATHUS, Doubl.	Darjiling. Assam.
var. <i>Andamana</i> , Moore.	Andamans.
DILIPA MAROLANA, Westw.	Khasi Hills.
CASTALIA CHANDRA, Moore.	Yunan. Darjiling.
APATTRA AMBICA, Kollar.	Darjiling.
„ PARISATIS, West. et Hew.	Darjiling. Java.
„ PARVATA, Moore.	
„ SORDIDA, Atkinson.	

HELYRA HIMINA, Hew.

ADOLIAS ALPHEDA, Godt.

„ LEPIDEA, Butler.

„ GARUDA, Moore.

Yunan. Tenasserim.

Yunan. Bengal.

Larva feeds on *Trophis aspera*, *Bryonia* and 'Mango' (Grote).

„ SATROPACES, Hew.

Tenasserim.

„ FRANCIE, G. R. Gray.

Yunan. Darjiling.

„ *A. raja*, Feld.

„ PARVULA, Moore.

Tenasserim.

„ DISCUSPILOTA, Moore.

Tenasserim.

var. *A. latimargo*, Moore.

Andamans.

„ SANCARA, Moore.

Darjiling.

„ IVA, Moore.

Darjiling.

„ LADA, Boisd.

„ EUMOLPHUS, Cram.

Tenasserim.

„ ANTHELUS, Boisd.

Tenasserim.

„ ADIMA, Moore.

Assam.

„ PSEUDO-CENTAURUS, Doubl.

Tenasserim.

„ MYCALE, Boisd.

„ EPIMUTA, Boisd.

„ ZIFA, Moore.

Andamans.

„ TAOOANA, Moore.

Tenasserim.

„ NARADA, Horsf.

Andamans.

„ NAKULA, Feld.

Tenasserim.

„ CENTAURUS, Fabr.

Andamans.

„ VIHARA, Feld.

Andamans.

„ PHEMIUS, Doubl.

Darjiling.

„ KESAVA, Moore.

„ SAMADA, Moore.

„ APLADES, Menetr.

Darjiling.

„ *A. sedera*, Moore.

„ TOLCHINIA, Menetr.

„ APHIDAS, Hew.

„ BALARAMA, Moore.

„ LUBENTINA, Cram.

Bengal.

Larva feeds on *Loranthus* (Grote).

„ COCYTUS, Fabr.

Bengal. Canara.

„ NESIMACHUS, Boisd.

„ NICEA, Gray.

Darjiling.

„ DURGA, Moore.

Darjiling.

„ SAHADEVA, Moore.

„ NESIMACHUS, Boisd.

Darjiling.

„ CONFUCIUS, Westw.

„ SIVA, Westw.

Darjiling. Yunan.

LEXIAS DIRTEA, Fabr.

Yunan. Assam. Borneo.

*A. Boisduvalii*, G. R. Gray.

THADUCA MULTICAUDATA, Moore.

Tenasserim.

SYMPHEDRA THYELIA, Fabr.

„ TECTA, Doubl. et Hew.

Silhet. Java.

„ var. TECTOIDES, Moore.

Andamans.

NYMPHALIS ATHAMAS, Drury.

Yunan. Andamans. Tenasserim.

„ BERNARDUS, Fabr.

Tenasserim. Darjiling.

„ MARMAX, Westw.

Tenasserim.

„ AGNA, Moore.

Tenasserim.

„ DELPHIS, Doubl.

Bengal.

„ SAMATHA, Moore.

Tenasserim.

NYMPHALIS DELPHIS, Doubl. (119).	Silhet.
„ BESA, Moore.	Tenasserim.
„ HARPAX, Feld.	Tenasserim.
„ FABUS, Fabr.	
„ DOLOX, Westw.	Darjiling.
„ EUDAMIPPUS, Doubl.	Darjiling.
KALLIMA BISALTIÆ, Cram.	Tenasserim. Andamans. Darjiling.
„ PRATIPA, Feld.	Tenasserim. Andamans.
„ LIMBORGH, Moore.	Tenasserim.
„ ALBOFASCIATA, Moore.	Andamans
„ INACHIS, Boisd.	Yunan. Darjiling.

This species, when flying, turns off at right angles to settle with closed wings and *head downwards* on a stem of bamboo, when its close similitude to a dead leaf renders its detection almost an impossibility, unless the actual spot where it alighted had been marked. This suddenly turning off to settle, at right angles to its line of flight, is what I have observed in no other butterfly (Nicéville).

THAUMANTIS DIORES, Doubl.	Cherra.
„ NOURMAHAL, Westw.	Darjiling.
„ CAMADEVA, Westw.	Darjiling.
„ RAMDEO, Moore.	Darjiling.

#### Family Morphidæ.

ZEUXIDIA MASONI, Moore.	Tenasserim.
DISCOPHORA TALLIA, Cram.	Tenasserim. Darjiling.
„ CELINDE, Stoll.	Andamans. Darjiling.

The larva feeds on the young leaves of *Cocos nucifera*.

„ ZAL, Westw.	Tenasserim.
„ NECHO, Feld.	Tenasserim. Andamans.
ENISPE EUTHYMUS, Doubl.	Darjiling.
„ CYCNUS, West.	Bengal.
NEORINA HILDA, Westw. et Hew.	Darjiling.
„ KRISHNA, Westw. et Hew.	Bengal.
AMATHUSIA AMYTHAON, Doubl.	Silhet.
„ PHIDIPPUS.	Pinang. Java.

The larva feeds on *Cocos nucifera* in Java.

ÆMONA AMATHUSIA, Hew.	Naga Hills.
„ LENA, Atkinson.	Yunan. Andamans.
„ PEALIL, Wood-Mason.	Assam.
CLEROME ARCESILAUS, Fabr.	Tenasserim.
THAUMANTIAS LOUISA, Wood-Mason.	Tenasserim.

#### Family Danaidæ.

DANAIS TYTIA, Gray.	Tenasserim. Yunan. Butan.
„ LIMNACE, Cram.	Yunan. Nicobars. Java.

The larva in Java feeds on a species of *Epibatharium*.

„ GRAMMICA, Boisd.	Nicobars.
„ MELISSA, Cram.	Yunan. Java.
„ SIMILIS, L.	Java. N. India.
„ NESIPPUS, Feld.	Nicobars.
„ PLEXIPPUS, L.	Tenasserim. Nicobars. Yunan.
„ HEGESIPPUS, Cram.	Bengal. Pinang. Nicobars.
„ var. MELANIPPUS, Cram.	
„ CHRYSIPPUS, L.	Tenasserim. Yunan. Sikkim.

The larva feeds on the *Asclepias gigantea*.

DANAUS LEOPARDUS, Butler.		
„ AGALLA, Cram.	Tenasserim.	Yunan. Butan.
„ SEPTENTRIONIS, Butler.	Tenasserim.	Sikkim.
„ VULGARIS, Butler.	Tenasserim.	
„ MELANEUS, Cram.	Tenasserim.	Java. Sikkim.
„ MILLANOLEUCA, Moore.	Andamans.	
„ AGLOIDES, Feld.	Nicobars.	
SALPINX RHADAMANTHUS, Fabr.	Tenasserim.	
„ CRASSA, Butler.	Tenasserim.	
„ MASONI, Moore.	Tenasserim.	
„ MARGARITA, Butler.	Tenasserim.	
TREPESICHOIS MIDAMUS, L.	Tenasserim.	Yunan. Sikkim.
The larva feeds on a species of <i>Ficus</i> .		
CRATEA CUPREIDENNIS, Moore.	Tenasserim.	
IDEOPSIS DAOS, Boisd.	Tenasserim.	
HESTIA CADELLI, Wood-Mason.	Andamans.	
„ HADENI, Wood-Mason.	Pegu.	
„ AGAMARSCHANA, Feld.	Andamans.	
STRICTOPLÆA GROTEI, Feld.	Tenasserim.	
EUTPLÆA ALCATHOE, Godt.	Tenasserim.	Silhet.
„ KLUGII, Moore.	Tenasserim.	Yunan. Butan.
„ SIAMENSIS, Feld.	Yunan.	
„ ANDAMANENSIS, Atkinson.	Andamans.	
„ SIMULATRIX, Mason et Nicé.		
„ CORE, Cram.	Andamans.	
„ LIMBORGHII, Moore.	Tenasserim.	
„ SUBBITA, Moore.	Tenasserim.	
„ GODARTI, Lucas.	Tenasserim.	
„ NOVARA, Feld.	Nicobars.	
„ ESPERI, Feld.	Nicobars.	
„ CAMORTA, Moore.	Nicobars.	
„ DOUBLEDAYI, Westw.		
„ DEIONE, Westw.	Darjiling.	
TELCHINIA VIOLE, Fabr.	Bengal.	
PARIBA VESTA, Fabr.	Yunan. Darjiling.	
The larva feeds on <i>Passiflora</i> and <i>Thunbergia</i> (Grote) (and on <i>Urtica</i> in Java).		

#### Family Pieridæ.

PRIONERIS CLEMANTHE, Doubl.	Tenasserim.	Martaban.
„ <i>P. Helfer</i> , Feld.		
„ SETA, Moore. ♀	Butan.	
„ TRESTYLIS, Doubl.	Yunan.	Butan.

Moore considers the last the female of this species, but Butler considers them distinct (P. Z. S. 1865, 759; 1872, 27).

„ WATSONI.	Tenasserim.	Silhet.
------------	-------------	---------

Very like a dwarf var. of *P. Seta* ♂, but with a female more nearly resembling itself (Butler, l.c.).

DELIAS DESCOMBESI, Boisd.	Martaban.	Pinang.	Nipal.
„ AGOSTINA, Hew.	Darjiling.		
„ EUCHARIS, Drury.	Nipal.	Ceylon.	Pinang.

The larva feeds on *Loranthus* (Grote).

„ BELLADONNA, Fabr.			
„ PASTHOE, L.	Tenasserim.	Martaban.	Yunan.
<i>P. Aglaia</i> , L.			



<i>P. Dione</i> , Drury.	
<i>P. Porsenna</i> , Cram.	
<b>DELIAS</b> <i>SANACA</i> , Moore.	Darjiling.
„ <i>HYPARITE</i> , L.	Assam. Pinang. Java.
<i>P. Autonoe</i> , Cram. ♀	
„ <i>DIVACA</i> , Moore.	Burma.
„ <i>DIKETE</i> , Hübn.	Siam. Pinang.
var. <i>INDICA</i> , Wallace.	Martaban. Barrackpur.
„ <i>THISEE</i> , Cram.	Darjiling. China.
<b>APTAS</b> <i>LIBYTHEA</i> , Fabr.	Tenasserim. Punjab. Ceylon.
<i>Pap. Zelniera</i> , Cram. (Pap. Exot. Pl. 320, f. E. F).	
<i>Pier. libitina</i> , Godt.	
<i>Pier. Nerissa</i> , Godt.	
<i>Pier. Rouxi</i> , Boisd.	
„ <i>ZELMIRA</i> Cram. (Pap. Exot. Pl. 320, f. C. D).	Martaban.
<i>Pier. Larissa</i> , Feld.	Silhet.
„ <i>DARADA</i> , Feld.	Martaban.
„ <i>GALATHEA</i> , Feld.	Nicobars.
„ <i>ALOPE</i> , Wallace.	Tenasserim. Java. Borneo.
<i>Pier. amasene</i> , Boisd.	Tenasserim.
<i>Pier. neomba</i> , Moore. (C.L.E.I.C.).	Tenasserim.
„ <i>DAPHA</i> , Moore.	Tenasserim. Andamans. Martaban.
„ <i>PAULINA</i> , Cram.	Ceylon. Darjiling.
„ <i>HIPPO</i> , Cram.	Silhet.
„ <i>GALBA</i> , Wallace.	Silhet.
„ <i>COLIMBA</i> , Boisd. ♂	
<i>Pier. Indra</i> , Moore. ♀	
„ <i>LALAGE</i> , Doubl. ♀	Silhet. Yunan. Assam.
<i>P. durvasa</i> , Moore. ♀	
„ <i>VACANS</i> , Butler. ♂	Tenasserim. Darjiling.
<b>BELENOIS</b> <i>MESSENTINA</i> , Cram.	Ceylon. Barrackpur.
<i>Pap. aurota</i> , Fab.	
The larva feeds on <i>Capparis sepiaria</i> and <i>Zizyphus</i> (Grote).	
<b>PONTIA</b> <i>NERISSA</i> , Fab.	Sikkim. Martaban. Nipal.
<i>Pap. amasene</i> , Cram.	
<i>Pap. coronis</i> , Cram.	
„ <i>ZEUXIPPE</i> , Cram.	
<i>P. cassida</i> , Fab.	
<i>Pier. hira</i> , Moore.	
„ <i>AMALIA</i> , Vollenhoven.	Martaban. Singapore.
„ <i>PHYRYNE</i> , Fabr.	Martaban. Yunan. Masuri.
„ <i>REMBE</i> , Moore.	Ceylon.
var. <i>Pier. amba</i> , Wallace.	Tenasserim.
„ <i>LEA</i> , Doubl.	Martaban.
„ <i>NADINA</i> , Lucas.	Silhet.
var. (Pier.) <i>NAMA</i> , Moore.	Tenasserim. Andamans. Yunan.
„ <i>NINA</i> , Fabr.	Tenasserim. Java. Canara.
<i>Pap. xiphias</i> , Fabr.	
<b>COLIAS</b> <i>EDUSA</i> , Fabr.	Yunan. Butan.
var. <i>FIELDII</i> , Menct.	
<b>IDMAIS</b> <i>CALAIS</i> , Cram.	Balazor. Madras.
<b>TERIAS</b> <i>HECABE</i> , L.	Yunan. Tenasserim. Nicobars.
The larva feeds on a species of <i>Eschynomene</i> .	
„ <i>SILHETANA</i> , Wallace.	Yunan.
„ <i>VENATA</i> , Moore.	Tenasserim. Yunan.
„ <i>SVAVA</i> , Boisd.	Tenasserim.

TERIAS FORMOSA, Hübn.	Andamans. Tenasserim.
„ LILYA, Boisd.	Tenasserim. Cuttack. Darjiling.
„ NICOBARIENSIS, Feld.	Andamans. Nicobars.
„ HARINA, Horsf.	Andamans. Java. Darjiling.
„ PAULINA, Feld.	Nicobars.
var. <i>Galathea</i> .	Nicobars.
„ PRONA, Horsf.	Darjiling. Nicobars. Java.
„ BLANDA, Boisd.	Darjiling. China.
„ PANDA, Godt.	Great Nicobar. Java.
ERONTA AVATAR, Moore.	Darjiling.
„ VALLERIA, Cram.	Java. N. India.
<i>Pieris indica</i> , Doubl.	
<i>P. hippia</i> , Fabr.	Yunan.
<i>Thya indica</i> , Wallace (?).	Martaban.
„ SARAKA, Moore.	Andamans.
„ LUTESCENS, Butler.	Tenasserim.
PIRIS SELETE, Menet.	Yunan.
„ LICHENOSA, Moore.	Andamans. Kar Nicobar.
„ DEVACA, Moore.	Burma.
„ CLEONORA, Boisd.	Martaban.
„ LAGELA, Moore.	Tenasserim.
METAFORIA AGATHON, Gray.	Nipal. Cherra.
„ PHRYXE, Boisd.	Butan.
SYNCHLOE CANDIDA, Sparrman.	Yunan. Silhet. Punjab.
<i>Pap. glyciria</i> , Cram.	Hongkong.
<i>Pier. glaphyra</i> , Godt.	
„ NIPALENSIS, Gray.	
<i>Pier. Brassicae</i> , L. var. E.	
HEBOMOIA GLAUCIPE, L.	Tenasserim. Andamans. Yunan.
The larva feeds on a species of <i>Capparis</i> .	
„ REESTORFFI, Wood-Mason.	Andamans.
IXIAS EVIPE, Drury.	Darjiling.
„ LATIFASCIATUS, Moore.	Maulmain.
„ SESIA, Fabr.	Blutan.
„ ANEXIBIA, Hübn.	Bengal.
<i>Pap. pyrene</i> , Cram., Figs. A. C.	
„ PYRENE, L.	Yunan. Butan. Silhet.
<i>Pap. anippe</i> , Cram., Figs. C. D.	
„ MARIANNE, Cram.	Maulmain. Ceylon.
„ VENATRIX, Wallace.	Maulmain.
„ CHIRINA, Moore.	Tenasserim.
„ PALLIDA, Moore.	Tenasserim.
„ MAULMEINENSIS, Moore.	Tenasserim.
„ ANDAMANA, Moore.	Andamans.
„ VENILIA, Godt.	Martaban. Java.
CALLIDRYAS PYRANTHE, L.	Malda. Andamans. Yunan.
<i>P. chryseis</i> , Drury.	
„ PHILIPPINA, Cram.	Tenasserim. Andamans.
„ CATILLA, Cram.	Malda. Martaban. Yunan. Java.
„ RHARJA, Cram.	Tenasserim. Andamans. Nicobars.
„ CROCALE, Cram.	Malda. Java. Yunan.
„ ALCMEONE.	Yunan. Darjiling.
DERCAS VERHUELLI, Van der Hoeven.	Yunan. Bengal.
NISONIADES DASAHARA, Moore.	Tenasserim.
„ INDISTINCTA, Moore.	Bengal.
„ SALSALA, Moore.	Tenasserim. Java.
„ DIOCLES, Boisd.	Tenasserim.
„ SUBFASCIATUS, Moore.	

Family **Papilionidæ.**

ORNITHOPTERA BELIACONOIDES, Moore.	Andamans.
„ POMPEUS, Cram.	Darjiling.
The larva feeds on an <i>Aristolochia</i> .	
„ RHADAMANTHUS, Boisd.	Martaban. Darjiling.
BRITANNIUS LINDERDALII, Atkinson.	Buxa.
PAPILIS AGESTOR, Gray.	Darjiling.
„ ANTIQUATES, Cram.	Tenasserim. Andamans. Yunan.
The larva feeds on a species of <i>Uvaria</i> .	
„ AGAMEMNON, L.	Tenasserim. Andamans. Nicobars.
The larva feeds on a species of <i>Uvaria</i> .	
„ ARCTURUS, Westw.	Darjiling.
„ ALCMENOR.	Tenasserim.
„ ANDROGEOS, Cram.	Darjiling. Siligori.
„ AGETES, Westw.	Darjiling.
„ ANTICRATES, Doubl.	Darjiling.
„ ARISTOLOCHIE, Fabr.	Tenasserim. Nicobars. Sikkim.
var. <i>Kamorta</i> , Moore.	
„ BOOTES, Westw.	Bengal.
„ CASTOR, Westw.	Yunan. Silhet.
„ CARYAPA, Moore.	Calcutta.
„ CHAON, Westw.	Cherra. Borneo.
„ CHIRON, Wallace.	Yunan.
<i>P. bathycles</i> .	
„ CLOANTHUS, Westw.	Yunan. Masuri.
„ COON, Fabr.	Martaban. China.
„ CHARICLES, Hew.	Andamans.
„ BASARADA, Moore.	Cherra.
„ DIPHILUS, Esper.	Bengal.
„ DISSIMILIS, L.	Yunan. Masuri. Ceylon.
<i>P. Panope</i> , L.	
<i>P. Clytia</i> , L.	
var. FLAVOLIMBATUS, Ober.	Andamans.
„ DEOLEON, Cram.	Martaban.
<i>P. Cresphrontes</i> , Fabr.	
„ DOUBLEDAYI, Wallace.	Martaban. Tenasserim.
The larva feeds on a species of <i>Fagara</i> , in Java.	
„ ELEPHENOR, Doubl.	Silhet.
„ EPHYCIDES, Hew.	Darjiling.
„ EVAN, Doubl.	Silhet.
„ ERITHONIUS, Cram.	Yunan. Bengal. Canara.
The larva feeds on the Citron.	
„ EURYPYLUS, L.	Tenasserim. Andamans. Silhet.
„ GLYCERION, Gray.	
„ GANESA, Doubl.	Darjiling.
„ GYAS, Westw.	Darjiling.
„ HECTOR.	Bengal. Ceylon.
The larva feeds on <i>Aristolochia indica</i> .	
„ HELENUS, L.	Tenasserim. Darjiling. Java.
„ JANAKA, Moore.	Darjiling.
„ JASON, Esper.	Balasar.
Larva feeds on <i>Michelia champa</i> and <i>Uvaria longifolia</i> (Grote).	
„ ICARIUS, Westw.	

PATILIS KRISHNA, Moore.	Butan.
.. LESTRYGONUM, Wood-Mason.	Andamans.
.. MAYO, Atkinson.	Andamans.
.. MAHADEVA, Moore.	Tenasserim.
.. MEGARUS, West.	Tenasserim. Silhet.
.. MINCKEEL, Gray.	Darjiling.
.. MEMNON, L.	Martaban.
<i>P. Laomedon</i> , Cram.	
<i>P. Androgeos</i> , Cram.	Tenasserim.
.. MACHAON, L.	Butan. Masuri.

The larva feeds on Carrot and Radish.

.. NOMIUS, Esper.	
.. ONPAPE, Moore.	Tenasserim.
.. POMPEIUS, Cram.	
.. PAMMON, L.	Tenasserim. Nicobars. Yunan.
var. NICOBARICUS, Feld.	

The larva of this and other species is very injurious to various species of *Citrus*.

.. POLYTES, L.	Bengal. Java.
var. NICOBARICUS, Feld.	Andamans.
.. PROTENOR, Cram.	Butan.
.. POLYMNESTOR, Cram.	Bengal. Ceylon.
.. PAYENI, Boisd.	Darjiling.
.. PHILOXENUS, Gray.	Tenasserim. Darjiling. Chunnabatti.

"Sails about high up among the trees and apparently quite safe from the attacks of birds, its strong scent, perceptible a couple of yards off even now, three months after it was caught, being probably most distasteful to insectivorous birds" (Nicéville). M. Nicéville may be right as to birds disliking the particular stink of this insect, but the *teleological* argument implied must be accepted with great caution. It is at least equally probable as not, that some bird or other insectivore cares very little for the stink, else the survival of the fittest would as it were be synonymous with the survival of the nastiest. There are some things in nature no one can precisely explain, and the stink of *P. philoxenus* is paralleled teleologically speaking by the poison of serpents. If the poison glands and fangs of serpents were really necessary or subservient to their well-being in the struggle of existence, how comes it that the majority of serpents get on very well without such aids? and if *P. philoxenus* is designedly preserved from dangers by its stink, how comes it that the bulk of *Lepidoptera* do not stink for the same reason? It is better to confess ignorance of the ways of Lady 'Why,' than delude ourselves with transparent fallacies of the teleological class.

.. RAVANA, Moore.	Darjiling.
.. PARIS, L.	Cherra. Sikkim.
.. ROMULUS, Cram.	Bengal.
.. RUTENOR, Westw.	Darjiling.
.. RHODIFER, Butler.	Andamans.
.. SARPEDON, L.	Tenasserim. Ceylon. Masuri.
.. SCLATERI, Westw.	
.. THALIARCHUS, Hew.	Tenasserim.
.. TELEARCHUS, Hew.	Tenasserim.
.. VARUNA, White.	Ranjit Valley at 1000 feet.
<i>P. astorion</i> , Westw.	
.. XANTHUS, L.	Yunan.
.. ZENOCLES, Doubl.	Tenasserim. Silhet. Darjiling.
.. ZELEUCTUS, Hew.	Tenasserim.
LEFTOCIRCUS MEGES, Zinken-Sommer.	
.. CURIUS, Fabr.	
.. VIRESCENS, Butler.	Martaban. Tenasserim.

TEINOPALPUS IMPERIALIS, Hope.

Hills over 9000.

CALINAGA BUDDHA, Moore.

The above is a goodly list of Lepidoptera, inhabiting Burma and the adjoining countries. It is true that as yet the majority of them are unrecorded from any Burmese 'habitat,' but then Burma has not yet been worked as Bengal has, and there can be no reasonable doubt that insects which range from Darjiling to Java occur in Burma likewise. Equally certain is it that numberless species, only as yet recorded from Sikkim, will range into Arrakan and Pegu, whilst other species hitherto recorded from Java or Borneo will be found to range into Tenasserim as well. Excluding Martaban and Tenasserim, Burma is still an almost untrodden field Entomologically.

Little need be said touching the capture of the diurnal species, but it may be added that an excellent plan for capturing the nocturnal moths is to smear trees about one's house, towards evening, with a mixture of beer and sugar, which will attract the moths to it. It should also be remembered that each species has its *own proper time of flying*, and that the same species will not be captured between 8 and 10 p.m. and 10 and 12, and so on. Separate days should therefore be given to different hours of the night, if a thorough exploration of the Lepidopterous fauna of a district be attempted, and this pursuit of the perfect insect should not supersede the study of the life history of each species, as displayed in its progress from the egg, through the caterpillar to the perfect insect.

#### Order COLEOPTERA.

Wings four, the anterior pair (*elytra*) hard and closing over the back by a straight suture. The posterior pair in repose folded beneath and protected by the *elytra*. Mouth mandibulate. The females rarely apterous.

A convenient division of the Families of Coleoptera is based on the number of joints of the tarsi, though, as in most artificial arrangements, exceptions occur.

##### Section TRIMERA.

Tarsi three-jointed.

##### Sub-order APHIDIPHAGA.

##### Family Coccinellidæ.

The *Coccinellidæ* or Lady-birds are a well-marked and familiar class of insects, all of which are useful to man, by preying in both their larval and adult stages on the aphides or plant-lice which infest his gardens.

HARMONIA SEPTEMPUNCTATA, L.

LEIS BICOLOR, Hope.

„ 19 SIGNATA, Falder.

LEMNIA PLAGIATA, Fabr.

„ BIPLAGIATA, Swartz.

„ (?) SEXAREATA, Muls.

COCCINELLA, sp.

EPILADENA MACULARIS, Muls.

##### Section TETRAMERA.

Tarsi four-jointed.

##### Sub-order CLAVIPALPI.

Last three joints of the antennæ clavate. Maxillary palpi with the last joint broadly transverse.

##### Family Erotylidæ.

FATUA, sp.

Sub-order *PHYTOPHAGA*.

Antennæ linear. The elytra cover the sides of the abdomen.

Family **Cassididæ.**

The *Cassididæ* are sometimes called 'tortoise beetles' from their shield-like form.

ASPIDOMORPHA SANCLE-CRUCIS, Fabr.

COPTOCYCLA CATINATA, Bohem.

„ PUNCTARIA, Bohem.

Tenasserim.

PRIOTERA PALLIDICORNIS, Bohem.

Tenasserim.

LACOPTERA NOVENDECIMNOTATA, Bohem.

## SAGRIDÆ.

SAGRA MOUHOTI, Baly.

## CRIO CERIDÆ.

TEMNASPIS MOUHOTI, Baly.

CRIOCERIS IMPRESSA, Fabr.

## HISPIDÆ.

ANISODERA EXCAVATA, Baly.

CRASPEDONTA LEAYANA, Latr.

## HALTICIDÆ.

GRAPTODERA, sp.

CACOSCELES, sp.

## EUMOLPIDÆ.

CORYNODES PEREGRINUS, Herbst.

EUMOLPUS, sp.

## CHRYSEMELIDÆ.

PARALINA CYANICOLLIS, Hope.

LINA, sp.

## CLYTHRIDÆ.

DIAPROMORPHA MELANOPUS, Dej.

## CRYPTOCEPHALIDÆ.

CRYPTOCEPHALUS, sp.

## GALERUCIDÆ.

HAPLOSONYX SMARAGDIPENNIS, Chev.

„ QUADRIFASCIATA, Hope.

CALLOPISTRA FULMINANS, Faldern.

RHAPHIA CYANIPENNIS, Baly.

AULACOPHORA, sp.

RHAPHIDOPALPA SEXMACULATA, Hope.

PHYLLOTRETA CYANURA, Hope.

„ LUREATA, Redtenb.

ADORIUM MACULIVENTRIS, Chev.

GALERUCA, sp.

Sub-order *LONGICORNIA*.

Antennæ long. Body elongate. Female with an ovipositor.

These beetles, and the members of the next sub-order, are in their larval stage wood-borers, the soft grub being armed with powerful jaws with which it perforates both live and dead wood. As the grub progresses, it devours the wood in front of it, and *pari passu*, ejects a comminuted mass of woody fibres, which, after passing through its intestines, form almost as solid a mass as the wood did prior to its mastication.

*Family Prionidæ.*

*EGGOSOMA SULCIPENNE*, White. Tenasserim.

*Family Cerambycidæ.*

*HAMMATICHERUS SIMULANS*, White. Tenasserim.  
*NIRIUS TRICOLOR*, Newbern. Tenasserim.  
*POLYZONUS BIZONATUS*, White. Maulmain.  
*HELIOMANES NIGRICEPS*, White. Maulmain.  
*CLYTUS SEMILUCIOSUS*, White. Tenasserim.  
*BATOCERA ROYLEI*, Hope.  
*CEROPLESIS TRIGINCTA*, Dej.  
*LAMIA WALLICHI*, Hope.  
*ROSALIA*.  
*BLITTEPHAEUS SUCCINCTOR*, Chevrol.  
*PERPURICLINUS TEMMINCKI*, Guér.  
*EURYBATUS NOVEPUNCTATUS*, Westw.  
*APOMECCYNA ALBOMACULATUS*, Perroud.  
*GLENEA*.

Sub-order *XYLOPHAGA*.

Antennæ short. Maxille with one lobe.

Sub-order *RHYNCHOPHORA*.

Larvæ apodal. Head prolonged into a rostrum, which may attain to three times the length of the body. Antennæ geniculate (bent like the knee), with its basal joint received into a groove. This sub-order embraces the '*weevils*,' which in both their larval and adult stages are so destructive to fruit and cereals. A common example of this class of insects is the little grub or beetle, which is so often exposed on cutting open a mangoe. These beetles possess in a remarkable degree the habit of feigning death when alarmed, or touched.

*Family Curculionidæ.*

*APODERUS*, sp.  
*ARRHENODES*, sp.  
*CYRTOTRACHELUS*, sp.  
*CLEONUS*, sp.  
*LIXUS*, sp.  
*BLOSIRUS*, sp.  
*SIPALUS GRANULATUS*, Fabr.

Section *HETEROMERA*.

The four anterior tarsi five-jointed; the posterior four-jointed.

Sub-order *TRACHELIDA*.

Head exerted, narrowed behind into a neck. Antennæ never clavate (except in *Tetraloma*). Many species are parasitic.

*Family Cantharidæ.*

*CANTHARIS NEPALENSIS*, Hope.

Various species of this genus possess the power of blistering the skin, and are valuable on that account, the best known being the common '*spanish fly*,' or blistering beetle (*Cantharis vesicatoria*). The following extract from Sir J. Lubbock's "Origin and Metamorphosis of Insects" will give a good idea of the curious changes undergone by a near ally of the last genus (*Cantharis*).

"The genus *Sitaris* (a small beetle allied to *Cantharis*, the blister fly, and to *Meloe*, the oil beetle) is parasitic on a kind of bee (*Anthophora*), which excavates subterranean galleries, each leading to a cell. The eggs of the *Sitaris*, which are deposited at the entrance of these galleries, are hatched at the end of September or the beginning of October, and M. Fabre (*Ann. des Scien. Nat.*, sér. 4, tome vii.) not unnaturally expected that the young larvæ, which are active little creatures, with six serviceable legs, would at once eat their way into the cells of the *Anthophora*. No such thing; till the month of April following they remain without leaving their birthplace, and consequently without food, nor do they in this long time change either in form or in size. . . . In April, however, his captives at last awoke from their long lethargy, and hurried anxiously about their prisons. Naturally inferring that they were in search of food, M. Fabre supposed that this would consist either of the larvæ or pupæ of the *Anthophora*, or of the honey with which it closes its cell. All these were tried without success. M. Fabre was in despair. 'Jamais expérience n'a éprouvé pareille déconfiture. Larves, Nymphes, cellules, miel, je vous ai tous offert: que voulez-vous donc bestioles maudites?' The first ray of light came to him from our countryman, Newport, who ascertained that a small parasite found by Léon Dufour on one of the wild bees, and named by him *Triangulinus*, was, in fact, the larva of *Meloe*. The larvæ of *Sitaris* much resembled Dufour's *Triangulinus*, and acting on this hint M. Fabre examined many specimens of *Anthophora*, and found on them at last the larvæ of his *Sitaris*. The males of *Anthophora* emerge from the pupæ sooner than the females, and M. Fabre ascertained that as they came out of their galleries the little *Sitaris* larvæ fasten upon them. Not, however, for long; instinct teaches them that they are not yet on the straight path of development, and watching their opportunity they pass from the male to the female bee." This may be considered the first act of the drama; but marvellous is the faculty which the young *Sitaris* must be gifted with at its tender age to play the part necessary for its own existence. But to follow M. Fabre: "Guided by these indications, M. Fabre examined several cells of the *Anthophora*. In some the egg of the *Anthophora* floated by itself on the surface of the honey; in others on the egg, as on a raft, sat the still more minute larva of the *Sitaris*. The mystery was solved. At the moment when the egg is laid, the *Sitaris* larva springs upon it. Even while the poor mother is carefully fastening up her cell, her mortal enemy is beginning to devour her offspring, for the egg of the *Anthophora* serves not only as a raft, but as a repast. The honey which is enough for either would be too little for both, and the *Sitaris* therefore, at its first meal, relieves itself from its only rival. After eight days the egg is consumed, and on the empty shell the *Sitaris* undergoes its first transformation, and makes its appearance in a very different form. With the change of skin the active slim larva changes into a white fleshy grub, with the mouth beneath and the spiracles above the surface, 'grâce à l'embonpoint des ventre,' says M. Fabre, 'la larve est à l'abri de l'asphyxie.' In this state it remains till the honey is consumed, then the animal contracts and detaches itself from its skin, within which the further transformations take place. In the next stage, which M. Fabre calls the pseudo-chrysalis, the larva has a solid corneous envelope and an oval shape, and in its colour, consistency, and immobility reminds one of a dipterous pupa. The time passed in this condition varies much; when it has elapsed, the animal moults again; again changes its form, and after this it again becomes a pupa without any remarkable peculiarities. Finally after these wonderful changes and adventures, in the month of August the perfect *Sitaris* makes its appearance."

The above is an admirable sketch of the life history of a European species, but hundreds of similar histories might be written of Burmese species by a similar expenditure of industry in observing, as that displayed by M. Fabre, whose peaceful exploits are really as glorious and as worthy of imitation as any achieved by his heroic countrymen at Marengo or Austerlitz.

### Family Rhipidophoridae.

#### RHIPIDOPHORUS.



*Family* **Lagriidæ.**

LAGRIA BASALIS, Hope.

*Family* **Stylopidæ.**

These are the most aberrant of all beetles, and are minute parasites on bees, and the male only is winged, and ceases to be parasitic when adult. In this last stage he wanders about in search of his spouse, who is a minute grub-like creature buried in the body of some bee, with her terminal segment only protruded in the air between two of the 'rings' of the bee's body.

Sub-order **ATHRACHELLA.**

Head not exerted nor narrowed behind. Antennæ linear or sub-clavate. Claws undivided, in *Cistelidæ* serrated. The penultimate joint of the tarsus usually entire. The typical species of *Tenebrionidæ* have connate elytra and no lower wings.

*Family* **Tenebrionidæ.**

OPATRUM, sp.

EPILAMPUS, sp.

Section **PENTAMERA.**

All the tarsi five-jointed.

Sub-order **MALACODERMI.**

Many of this sub-order are animal feeders.

*Family* **Bostrychidæ.**

APATE, sp.

*Family* **Cleridæ.**

SIGMATIUS RECTIVENTRIS, Westw.

Assam.

TILLICERA CHALYBEA, Westw.

Tenasserim.

OMADIUS MEDIOFASCIATES, Westw.

Khasi Hills.

*Family* **Telephoridæ.**

ICHTHYURUS COSTALIS, Westw.

Maulmain.

,, BASALIS, Westw.

Maulmain.

LAMPYRIS, 2 sp.

The well-known '*glow-worm*' belongs to this genus. The male is winged and seeks his female, a heavy apterous grub, by aid of the light she displays to disclose her retreat to her mate. To this family also belong the '*fire-flies*,' which are beautiful objects during the still nights of the tropics and warm countries.

Sub-order **STERNOXI.**

Prosternum produced in front and pointed behind. Antennæ filiform or serrated. Vegetable feeders.

*Family* **Elateridæ.**

The *Elateridæ* are commonly known as '*skip-jacks*' or '*spring-beetles*.' By a sort of *catch* arrangement between the pro- and mesosternum, whereby the tense muscles are suddenly freed, a jerk is produced which throws the animal from off his back on to his legs again. It is not only to recover its legs, that this clicking is gone through, but if the animal is held by the extremity of the elytra, it will seek to free itself by repeated 'clicks.' Some species (*Pyrophorus*) are phosphorescent or '*fire-flies*' as they are comprehensively called.

CAMPOSTERNUS HOPEI, Westw.

Tenasserim.

*Family Buprestidæ.*

CATOXANTHA BICOLOR, Fabri

CHRYSOCHROA CHINENSIS, Lap. and Gory.

AGRILUS, sp.

Sub-order *LAMELLICORNIA.*Last three joints of the antennæ lamelliform, or in the *Lucanidæ* pectinate.

The Lamellicorn beetles are a very varied, interesting, and beautiful group of insects of very different types. Among them are the *Cetoniinæ* or rose or flower beetles, but among which comes that giant of his order the Goliath beetle of tropical Africa. The *Scarabæinæ*, or dung-rolling beetles, are remarkable for their industry in providing a nidus for their progeny. One such clay ball (externally clay, but internally made up of a ball of dung for the sustenance of the larva) may be seen in the British Museum, presented by Mr. Atkinson, but found by myself in the Arakan hills, where three, four, or five such balls are often found buried one over the other, and which, when wet, sometimes weigh over two pounds. The maker of these curious clay balls is not known. Smaller species of beetles commonly bury similar balls of clay and dung the size of tennis balls in ground where cattle are stalled, and these balls are sought for eagerly by the Burmese for the dainty grub which they contain, and which they devour with gusto. Still smaller beetles are familiar to every one as 'pill-rollers' on our roads, the male and female both helping to roll the ball wherein the object of their hope, love, and strong affection lies centred, preparatory to burying it in some secure place.

*Family Cetoniidæ.*

RHOMBORRHINA.

GLYCYPHANA MARGINICOLLIS, Gory et Perch.

LOMAPTERA VIRIDIÆNEA, Gory et Perch. Tenasserim.

*Family Scarabæidæ.*

COPRIS SAGAX, Schönh.

ONTHOPHAGUS.

ONITICELLUS BRAMA, Redt.

*Family Melolonthidæ.*

SERICA MICANS, Fabr.

APOGONIA.

SCHIZONYCHA.

LEPIDIOTA BIMACULATA, Saunder.

## MIMELIDÆ.

ANOMALA SPLENDENS, Hope.

MIMELA GLABRA, Hope.

EUCHLORE PERPLEXA, Hope.

,, MONOCHROA, Reiche.

POPILIA BIGUTTATA, Wiedm.

## DYNASTIDÆ.

HETERONYCHUS PICEUS, Fabr.

EUPATORUS HARDWICKI, Hope.

*Family Lucanidæ.*

LUCANUS ÆRATUS, Hope.

Tenasserim.

*Family* **Passalidæ.**

The present list of *Passalidæ* is drawn up from Stoliczka's monograph of the Indian species in J. A. S. B. 1873, Part II. p. 119.

AULACOCYCLINÆ.

CERAPTUS AUSTINI, Stål.	Naga Hills at 6000 feet.
TENIOCLERUS BICUSPIS, Kp.	Sikkim. Assam.

ERIOCNEMINÆ.

LEPTAULAX DENTATUS, Fabr.	Sikkim. Tenasserim. Philippines.
" BICOLOR, Fabr.	Sikkim. Andamans. Nicobars.
" PLANUS, Illig.	Burma. Andamans.

ACERALÆ.

ACERATUS GRANDIS, Barn.	Sikkim. Naga Hills. Cachar.
" EMARGINATUS, Fabr.	Sikkim. Cachar. Pinang. Nicobars.
<i>Passalus Nicobaricus</i> , Redtenbacher.	
BASILIANUS CANTORIS, Hope.	Sikkim. Assam. Malacca.
" CANCER, Perch.	Sikkim. Assam.
" ANDAMANENSIS, Stål.	Andamans. Nicobars.
" SIKKIMENSIS, Stål.	Sikkim at 1500 feet.

*Family* **Trictenotomidæ.**

TRICTENOTOMA CHILDRENI, Gray.	Tenasserim.
-------------------------------	-------------

Sub-order *CLAVICORNIA.*

Antennæ clubbed at the end, club two to five jointed.

*Family* **Cucujidæ.**

HECTARTHURUM BREVISSIMUM, Newm.	Tenasserim.
---------------------------------	-------------

Sub-order *BRACHELYTRA.*

Antennæ short, never clubbed. Elytra short, not covering the abdomen. Two anal appendages.

The beetles of this sub-order are generally animal feeders, living on carrion. Some, however, reside in ants' nests, or even with wasps. These brachelytrous beetles often fly into the eye and cause severe pain.

*Family* **Staphylinidæ.**

Sub-order *PALPICORNIA.*

Maxillary palpi elongate; antennæ short. The beetles of this sub-order are mostly aquatic, and when adult, herbivorous.

Sub-order *ADEPHLAGA.*

Two palpi to each maxilla. Antennæ filiform. These beetles, in both the larval and adult stages, are voracious animal feeders. The two first families are wholly aquatic.

*Family* **Gyrinidæ.**

These beetles derive their name from ceaselessly circling about on the surface of the water, often in great numbers together.

*Family Dytiscidæ.*

DINEUTIS LATORIALIS, Leach.

DYTISCUS, sp.

The large water beetle, with a pale margin to its elytra, belongs to this genus, and freely takes flight by night. It will, when attracted by lights on a table, alight in a tumbler of water, and I once saw it perform this descent into a glass of beer. It is, in its native element, a savage and destructive animal, killing young trout and other fish, as well as destroying their ova.

*Family Carabidæ.*

CHLENIAS, 2 sp.

OMASSEUS.

HARPALUS.

To this order belong the 'bombardier beetles,' as they are called, from their spurting from beneath their elytra, which they slightly elevate for the purpose, a penetrating acid vapour and fluid, which, should it enter the eye, causes severe pain. One common species is a large dark beetle, with four white spots on its elytra; and incautiously seizing one once, I was nearly blinded by a jet of fluid it discharged into my eye. *Horresco referens*!

*Family Cicindelidæ.*

CYCINDELA CHLORIS, Hope.

,, HIMALEYICA, Redt.

,, FLAVOMACULATA, Kollar.

The *Cicindelidæ*, or 'tiger beetles,' as they are called, are among the most predatory of their order, being well armed with powerful jaws, and being swift both on foot and on the wing. They commonly frequent river banks, where they chase and devour any insects smaller and weaker than themselves. Dr. Mason writes: "A short time ago I observed one leap on a cockroach four times its own size and weight, like a lion upon an elephant."

Dr. Mason also enumerates the following beetles as found at Toung-ngoo by Capt. L. Smith:—

Coccinellidæ, 4; Cassididæ, 61 (*Cassida*, 6); Hispidæ, 1 (*Alburnus*); Chrysomelidæ, 36 (*Eumolpus* 6); Halticidæ, 15 (*Edionychis*); Crioceridæ, 4 (*Sagca*); Lamiidæ, 1; Cerambycidæ, 23; Prionidæ, 29 (*Prionus* 3); Curculionidæ, 73 (*Rhyssalus* 1, *Brenthus* 1, *Apoderus* 1, *Rhina* 10, *Calandra* 3); Cantharidæ 3 (*Horia* 2); Elateridæ, 10; Buprestidæ, 9; Scarabæidæ, 16 (*Atenichus* 3, *Onthophagus* 11, *Phanus* 2); Cetoniidæ, 35 (*Gymnetis* 2); Telephoridæ, 5 (*Lycas* 2); Staphylinidæ, 16; Hydrophilidæ, 1; Carabidæ, 31 (*Brachinus* 3); Cicindelidæ, 4; or 383 species, not one of which is named specifically.

The following remarks are condensed from Dr. Mason's chapter on Entomology. Under the head Chameleon beetles Dr. Mason remarks: "This changeable beetle is a species of *Buprestis*, an elegant insect with one uniform hue of variable copper and green, burnished with transparent golden bronze. The elytra, or wing cases, of these 'living jewels' are in great demand by the Sgau Karen maidens for necklaces and chaplets, and wreathed with a few wild flowers around their ebony locks, they have really an appearance of elegance. There is a still more brilliant and larger species of *Buprestis* which the Karens call the male of the preceding." Above, grass green, with blue, yellow, and golden reflections. Below, copper, bronzed with green. A crimson band runs down each wing cover, and a crimson spot at the base of the thorax. In general form it resembles *B. bicolor*. "Madame Merriam represented the larva of *B. gigantea* as a grub found underground, feeding on roots, but Westwood says, 'As it is, however, so different from the larvæ of the

*Buprestide*, and as in all probability the transformations are undergone in wood, the trunks of trees, etc., I fear that the authoress must have fallen into some error.' It falls to my lot to come to the aid of the lady, for the natives assure me that the transformations of these species of *Buprestis* are undergone in the earth, and that the larvæ form the papery cases with which I have often met."

Of the fire-flies, it is said, "According to the Buddhists, fire-flies were produced by the element of fire. The fire-flies appear to sip the nectar of flowers, and to be very choice in their selection. In the mangrove swamps and on the coast where *Egiceras* grows, that tree while in flower will be seen to be burning with their radiance, while all is dark around. In other situations I have observed the flowers of a wild species of *Cole* covered with them, to the exclusion of all the other plants in the neighbourhood."

My first experience of fire-flies in Pegu was a remarkable one. Night had closed in, and my servant, who brought in the tea, asked me to step out of my tent and see the fire-flies which, he said, he had never seen the like of before. On stepping out of the tent, a truly beautiful sight presented itself. In front was the broad and deep river sweeping on, *πυκτι λοικῶς*, with its indistinctly seen background of primeval forest on its opposite bank. Around me was the recently-formed clearing, with its two or three huts and my own camp, as the sole proof of man's occupancy, for miles and miles, but, for all the wildness and almost desolation of the scene, the bank on which I stood was a glorious spectacle, and those acquainted with the class of native servants will well understand that it must have been at once unusual and beautiful indeed to rivet the attention of a khitmutgar!

The bushes overhanging the water were one mass of fire-flies, though, from the confined space available for them on low shrubs, the numbers may not have been actually more than are often congregated in Bengal. The light of this great body of insects was given out in rhythmic flashes, and, for a second or two, lighted up the bushes in a beautiful manner; heightened, no doubt, by the sudden relapse into darkness which followed each flash. These are the facts of the case (and I may add, it was towards the end of the year), and the only suggestion I would throw out, to account for the unusual method of displaying their light, is, that the close congregation of large numbers of insects, from the small space afforded by the bushes in question, may have given rise to the synchronous emission of the flash, by the force of imitation or *sympathy*.

#### Order HYMENOPTERA.

Wings four, membranous, naked, veined. Mouth mandibulate and suctorial.

Larva usually apodal. Papa inactive.

Abdomen united to thorax by a pedicle. Females furnished with an ovipositor, normally consisting of six pieces, and often modified into a sting. The Hymenoptera are solitary or social, the latter forming communities consisting of a single fruitful female, numerous males called 'drones,' and a countless multitude of sexually undeveloped females or neuters, who carry on all the business of the nation. Agamic reproduction (*Parthenogenesis*) obtains in this order partially, as eggs laid by virgin 'queens' produce drones only.

#### Sub-order TEREBRANTIA.

Abdomen sessile. Female armed with a serrated or boring ovipositor. Larva with six legs and several prolegs. Vegetable feeders. The punctures made in trees or plants by the ovipositor give rise to 'galls.'

*TENTHREDO*, sp.

#### Sub-order PUPIFORA.

Abdomen petiolate. Larva apodal.

*Family Cyrripidæ.*

The insects of this family by laying their eggs in the tissues of trees and plants give rise to 'galls,' wherein the young are nourished on the juices of the plant, and whence they issue on attaining maturity.

*Family Ichneumonidæ.*

These insects are parasitical to the extent of depositing their eggs within the bodies of caterpillars, where the larva is hatched, and at once commences to consume its host. By an extraordinary instinct it would seem as if it so managed its meal as to avoid a vital part, and the caterpillar lives on 'if he cannot be said to thrive'), and even passes into the chrysalis stage for the benefit, alas! not of himself, but of his hidden guest. Beyond this stage, however, he does not survive, and in place of a butterfly, one or more 'rascally little flies' issue from the chrysalis, to the disgust perhaps of some naturalist who has been carefully feeding and tending the caterpillar in the hope of ascertaining the perfect insect. As a rule, however, a caterpillar which has been '*ichneumonized*' can be readily detected by one accustomed to these creatures, by a certain sluggish or sickly mood that seems to possess them.

PIMPLA, sp.

Sub-order *TUBULIFERA.*

Posterior segments of the abdomen retractile, and provided with a membranous ovipositor composed of a single piece. They are solitary insects, which deposit their eggs in the nests of other *Hymenoptera*.

*Family Chrysididæ.*

The *Chrysidæ*, or 'golden flies,' must be familiar to most people. They are met with hovering about and alighting on the hottest and sunniest walls, and are resplendent with green and azure tints. The under side of the abdomen is concave, and when touched they roll themselves into a ball. Giving just grounds of offence as they do, to insects of a singularly irascible disposition, this habit is no doubt one they are often called on to practise in self defence, and adaptively eased as their bodies are in an almost impenetrable coat of mail, they are in that position wholly invulnerable by the stings of their enemies.

Sub-order *HETEROGYNA.*

Social hymenoptera, consisting of males, females and neuters, the latter apterous and sexually undeveloped.

*Family Formicidæ.*

The marvellous economy of ants is too well known to need recapitulation, but of Burmese species we know next to nothing, and the subject is a very inviting one for some 'coming' naturalist. Ants swarm periodically, much in the same fashion, though not in the same numbers, as *Termites*, and the winged ants which then issue forth are males and females, bent on founding new colonies. Among some species the most enormous disparity of size obtains among the neuters, some of which, provided with disproportionately large heads, are called 'policemen,' and take upon themselves the care and defence of the ordinary workers. In one ant, common at Rangoon, I noticed three different sizes of neuters (?). The smallest was only 1.75 lines in length of head and body, whereas the 'policeman' measured 12 lines or more, and this disparity does not convey a proper idea of the vast difference in bulk between the two sorts, the policeman being a burly monster capable of walking away though 100 of the lesser sort were to attach themselves to him. In addition to these there were, mingled with the rest, many ants of an intermediate size, twenty times or so bulkier than the small neuters, but not comparable with the

'policeman.' Many rare beetles are found nowhere but in ants' nests. To obtain these, dig up the nest, and rapidly shovel the contents—earth, ants and all—into a sack, which remove to a convenient spot; after a while the ants will soon disperse, when the débris can be sifted, and the minute Coleoptera picked out.

*FORMICA SMARAGDINA.*

Under the head of edible ant, Dr. Mason remarks: "A species of ant is very common which constructs its nest in trees, formed of leaves united together with a papery substance, that the insect itself fabricates. The nests are sometimes a foot in diameter, and the ants are considered quite a delicacy with the Karens, who eat them in their curries. They are said to be very sour." This is probably identical with *F. smaragdina* or a closely-allied species. The crushed-up nests are sometimes seen in the bazaar, as the strongly acid flavour of these ants is relished as a condiment to their rice by the Burmese. They are most irascible and annoying insects, and often swarm on to the ropes of a tent, if they are secured to a tree which holds one of their nests. Should this be the case, it is best to find out another nest, cut it off, and place the branch, nest, and all on the top of the tent. In a short time its infuriated occupants issue forth, and proceed at once to grapple with the strangers already on the tent ropes, to whom they probably attribute their sudden change of quarters. The contest rages with dreadful fury, and is quite Homeric in its incidents. In all directions ants may be seen grappled with by their enemies, whilst several of their friends are at the same time holding on fast to them by legs or antennæ, to prevent their being carried off into captivity, whilst all around a pungent odour of formic acid rises from the belligerent host. No fiercer strife ever raged on the plains of Troy, and the noble simile of the eleventh Book is at once recalled.

"As in some rich man's domain  
The reapers drawn in rows,  
Right down the furrows shear the grain  
And still their labour grows,  
And thick the armfuls fall as rain;  
So Trojan and Achaian might  
Each on the other leapt.  
None turned from fight to cursed flight,  
But even battle kept."—*Iliad*, XI. 67 (Gladstone's Trans.).

The colour of the workers and males is rufous; but the queen is described as being of a pale-green colour, whence the specific name of the species.

*FORMICA OBLONGA.*

„ *TINCTA.*

*POLYRHACHIS AFFINIS.*

„ *ABDOMINALIS.*

„ *TIBIALIS.*

„ *MUTATUS.*

„ *LEVISSIMUS.*

„ *FURCATUS.*

„ *BICOLOR.*

*PONERA RELICULATA.*

„ *PALLIDA.*

*ATTA BELlicosA.*

*PREIDOLE OCELLIFERA.*

*Family Dorylidæ.*

The *Dorylidæ* differ from ants in the first segment only of the abdomen forming the pedicel. The sexes of several species are still unknown. One species is a heavy wasp-like insect, which often enters houses at night attracted by the lights. Their life history requires to be studied.

*DORYLUS LONGICORNIS*, Schuck.

Sub-order *FOSSORES*.

These are the fossorial Hymenoptera, including wasps and hornets; but many species make elaborate nests on the branches of trees, whilst others burrow in the ground or inside decayed trunks, or build nests of mud of various forms, and either single or many-celled. The larvae of the 'mud-builders' are carnivorous, and feed on the bodies of spiders or caterpillars, which the mother places in the cell for them, first disabling the victims in some way which deprives them of all power of motion or offence, without destroying their vitality. It is a pretty sight to see a large female hunting for spiders to stow in that dread mortuary of their race, the mud-cell wherein she has deposited an egg. She flies lightly along the ground in large circles, just skimming it, and as she goes, kicks over the leaves with her feet. Soon a spider is disturbed and endeavours to fly to a safer spot. Instantly the wasp is on its track, and if she loses sight of it, makes several rapid casts, turning over the leaves with redoubled activity, all the while giving out a terrific humming by the rapid vibration of her wings, which must have a paralyzing effect on the terrified spider; and rarely does the wretched quarry escape. It is pounced on, a nip given which makes it helpless, and in a few seconds this terror to most insects is himself crammed unresistingly into a narrow cell to form the food of a puny grub.

Family *Mutillidæ*.

"Stinging ants, as they are denominated, are very common, and their sting quite insufferable. They are not, however, ants, but a tribe of sand wasps, the females of which are destitute of wings" (Mason).

Family *Scoliidæ*.

<i>SCOLIA DIMIDIATA</i> , Guér.	
„ <i>INSTABILIS</i> , Smith.	
„ <i>RUBIGINOSA</i> , Fabr.	
„ <i>ANNULATA</i> , Fabr.	
<i>ELIS LINDENI</i> , St. Fargeau.	Tenasserim.
<i>ILLACOS ANALIS</i> , Fabr.	Tenasserim.

Family *Bembicidæ*.

<i>BEMBEX FESSORICUS</i> , Smith.	Tenasserim.
-----------------------------------	-------------

Family *Eumenidæ*.

<i>RHYNCHIUM CARNATICUM</i> .	
<i>EUMENES ARCUATUS</i> , Fabr.	Tenasserim.

Family *Vespidæ*.

<i>POLYBIA SUMATRENSIS</i> , Sauss.	Tenasserim.
„ <i>ORIENTALIS</i> , Sauss.	Tenasserim.
<i>POLISTES HEBLEUS</i> , Fabr.	
<i>VESPA BASALIS</i> , Smith.	Yunan.
„ <i>DORYLLOIDES</i> , Sauss.	Tenasserim.
„ <i>BELLONA</i> , Smith.	Yunan.

Family *Poneridæ*.

<i>DIACAMMA SCALPATRAM</i> , Smith.	Tenasserim.
-------------------------------------	-------------

Family *Sphegidæ*.

<i>AMMOPHILA NIGRIPES</i> , Smith.	Tenasserim.
<i>CHLORION LOBATUM</i> , Fabr.	Tenasserim.



## POMILIDÆ.

POMILUS DORSALIS, St. Farg.	
„ PERGRINUS, Smith.	Tenasserim.
„ VITIOSUS, Smith.	Tenasserim.
MACROMERIS VIOLACEA, St. Farg.	
MYGNIMIA ACROSERICEA, Guér.	

It cannot be contended that wasps are favourite insects with any people, as the damage they cause to our fruit, and the troublesome way they obtrude themselves within our dwellings in the long summer days, is compensated for by no sort of advantage derivable from them. At the same time, they display to the careful observer many estimable traits of character, and, if not so useful as bees, are from their greater diversity of habits even more interesting than these useful insects. For maternal solicitude and anxious devotion to the general welfare, for unwearied industry in building their combs and in foraging for supplies, and for reckless courage, they yield to no insects whatever. Their courage was so fully recognized by the Greeks that Homer (so judicious and careful with his similes) likens the Myrmidons, when led against the Trojans by Patroclus, to wasps in the memorable sixteenth Book of the Iliad, the passage being thus rendered by Lord Derby:

“They who in arms round brave Patroclus stood,  
 Their line of battle formed, with courage high  
 To dash upon the Trojans, and as Wasps  
 That have their nest beside the public road,  
 Whom boys delight to vex and irritate,  
 In wanton play, but to the general harm;  
 Them, if some passing traveller unawares  
 Disturb, with angry courage forth they rush  
 In one continuous swarm to guard their nest;  
 E’en with such courage poured the Myrmidons  
 Forth from the ships.”

Sub-order *MELLIFERA*.

Males, females, and neuters winged, the two last armed with stings. The basal joint of the posterior tarsi dilated, and adapted for storing and carrying pollen. The Bees are either solitary or social. The social communities (exemplified by the domestic bee) consist of a single fertile queen, several males, whose sole function is to furnish a partner for the virgin queen of a fresh swarm, and workers or sexually undeveloped females. The nuptial flight of the virgin queen is her first and last departure from the hive. Eggs laid by her before she has selected her mate, or if separated from the male, produce males only. In default of a perfect queen, the larva of a ‘neuter’ is selected, and by being reared in a differently formed cell to the ordinary ‘neuter’ cells and well fed, is converted into a queen, though this fact is less extraordinary than the last, as neuters are merely females whose ovaries are undeveloped, and which are by this mode of education stimulated into functional activity.

APIS INDICA, Fabr.	Tenasserim.
„ FLORALIS, Kirby.	
„ FLOREA, Fabr.	
„ DORSATA, Fabr.	
„ LABORIOSA, Smith.	

Domestic Bees are not kept in Burma, and the Burmese receive with polite incredulity the accounts of Bees being kept domesticated in the walls of dwelling-houses, as is the case in the Himalayas. A favourite place for a wild bees’ comb is the angle formed by the branch of some gigantic wood oil or other tree, as not only is the position sheltered from sun and rain, but it is not easily accessible by bears,

the trunk being too large and smooth for them to climb. To take the honey, a number of pegs of bamboo are prepared, which are driven about three inches deep into the bark one above another in a straight line. Affixed to these pegs a long bamboo, or two or more if necessary are tied, so that the failure of one or more pegs is immaterial so long as the rest hold, and at night, as I am informed (for I never witnessed the operation), a man ascends the bamboo right up to the comb, by means of the short projecting ends, purposely left on the bamboos at the joints. In his hand he carries a torch made of a peculiar jungle plant, which is so constructed that it shall throw out a great deal of smoke but no flame, and especial care is taken that there shall be no crackling of fire, which sound infuriates the bees. The smoking torch is now held under the comb till the bees have dispersed, and it is then quickly cut off and lowered down to the man's companions below, or if small brought down by him in a pot. The pegs driven into a tall tree stem are what every traveller in the Burmese forests must have noticed, but they are not used themselves as steps, as some suppose, but in the manner described.

The domestication of Bees, like that of most of our useful animals, dates from prehistoric times, and the prominent features of their social polity were known to Virgil, as we learn from his charming fourth *Georgic*. Their monarchical government he clearly shows, though we know that it is the Queen-mother who fills the place of King—

“Præterea regem non sic Ægyptos et ingens  
Lydia, nec populi Parthorum aut Medus Hydaspes  
Observant. Rege incolumi mens omnibus una est;  
Amisso, rupere fidem, constructaque mella  
Diripuerunt ipsæ, et crates solvere favorem.  
Ille operum custos; illum admirantur, et omnes  
Circumstant fremitu denso, stipantque frequentes;  
Et sæpe attollunt humeris, et corpora bello  
Obiectant, pulchramque petunt per vulnera mortem.”

(*Georg.* IV. 210.)

Bees, it may be added, were sacred among the ancients, and honey was one of the offerings to the dead Ulysses was charged to make, when about to consult in Hades the shade of Tiresias, in that magnificent, episode in the *Odyssey*, his descent to the nether-world.

“Here opened Hell, all Hell I here implored,  
And from the scabbard drew the shining sword;  
And trenching the black earth on every side,  
A cavern formed, a cubit long and wide:  
New wine with honey-tempered milk we bring,  
Then living waters from the crystal spring;  
O'er these was strewed the consecrated flour,  
And on the surface shone the holy store.”

(Pope's *Odyssey*, XI. 27.)

Worsley, in his excellent translation, has “mead” for ‘μελικρίτω,’ but in this instance Pope is more accurate in his mention of honey and milk.

The ‘bee’ figures on old Greek coins, and was the emblem of the city of Ephesus and of the Ephesian Artemis, and it has been suggested that the sacred character attaching to this insect led to the adoption of wax tapers in preference to all others in the gorgeous ceremonial of the Romish Church, a supposition by no means extravagant to those who know the intimate relation which subsists between the symbolism of Roman worship and the old Pagan religion, and how completely the Virgin in Catholic countries has inherited the symbols, attributes, and functions of the Queen of Heaven of old (to whom the Jews offered spice cakes), with her host of names—Artemis, Astarte, Isis, Tanith, and the like. (See also Inman's *Ancient Faiths*, under ‘Deborah.’)

Westwood estimates a community of the domestic Bee to consist of 2000 drones, 50,000 workers and 1 queen.

TRIGONA TERMINATA, Smith.  
 „ LEVICEPS.

Tenasserim.  
 Pegu.

*Trigona lariceps* or the 'Dammar Bee,' as it is called by Mason, is common in Pegu, and is a familiar insect, which, when one is reclined in the forest, will alight on the face or hand and carefully lick it, and when so engaged is readily caught. It is fond of getting into the beard and hair, where it is liable to become entangled; but this never puts it out of temper. The nest of this species is commonly made in hollow trees, and is sought, for the resin of which it is composed, and this substance is erroneously termed "wax" by Dr. Mason, as it seems to consist rather of vegetable resin gathered in the forests. It is called by the Burmese '*Pwai-nget*' and is exposed for sale in all large bazaars, being much used, when cooked up with earth oil, to caulk boats with. It is a well-known habit of many species of wasps to use resinous substances in the construction of their cells. Specimens sent by the Rev. C. S. Parish to England are said to have been identified by Mr. F. Smith with *T. lariceps*, originally described from Singapore.

In 'Science Gossip,' for 1866, p. 498, the Rev. C. S. P. Parish, then Chaplain of Maulmain, gives a very clear account of *Pwai-nget*. In Mr. Parish's opinion (in which I quite concur, *Pwai-nget* is composed mainly of the resinous exudation of *Hopce odorata* and species of *Dipterocarpi*. Mr. Parish thus describes the nest:—"The *Trigona lariceps* builds its nest generally in the hollow of a tree, entering by a small aperture. These apertures are lined with *Pwai-nget*, and sometimes only show a small rim of that substance raised above the bark of the tree. Sometimes, however (perhaps always if undisturbed), the bees go on building outside, and adding on to the rim until they have formed a wide-mouthed entrance, which projects as much as a foot from the tree. These structures commonly assume the shape of the mouth of a trumpet, flattened horizontally, and have a perpendicular diameter of a foot or so and a horizontal diameter of three or four inches." Speaking of this external tube Mr. Parish points out a remarkable feature of its structure. "By holding this up to the light you will see three or four large cells of about an inch in diameter, without any opening. I can only suppose that the object of these cell walls is to strengthen the narrow base in its support of the larger projecting mass. If so, here is another instance of a mysterious intelligence possessed by one of the smallest of living creatures." Doubtless Mr. Parish is right in his conjecture, and for countless eons before the birth of Brunel and Stephenson have these tiny creatures gone on applying the principle of cell structure or a double skin in mechanics, to their own dwellings, as intelligently and with as definitive an aim as man himself could. According to the sketch of the projecting tube, the *upper* angle of the structure is that which is strengthened by the construction behind it of blind cells. I would however venture to suggest if the true position is not here reversed, and if the blind cells in reality do not occupy the *lower* angle of the structure, as that is the part which most requires strengthening. It, as may possibly be the case in this or other instances, the cells really are placed along the upper part of the structure, they would still strengthen the wall and enable the bees to work into it a less amount of material than if it were unsupported from behind in that manner. I would also suggest a reason for the peculiar trumpet-shaped structure, and that is, to exclude water from the interior of trees selected by the insects for their nests. The operation of stopping up cracks in the tree is of course an easy one, but the insects would, for all that, run the risk of being drowned in their nests, by the rush of water pouring down the trunk of the tree during a tropical shower, but for this expanded trumpet-like aperture, slightly projecting beyond the surface of the tree and to that extent elevated above the reach of the heaviest stream of rain water that could ever run down it. A similar contrivance may also be noticed in some ants' nests in the ground or on the side of some overhanging bank, a circular, elevated and trumpet-shaped, and somewhat recurved entrance wall, a most perfect bar to the entrance of water into the nest, and precisely the same in principle as the porcelain

insulators used with the same object to support our telegraph wires. The preparation of the *Pwai-nget* for use is thus described by Mr. Parish: "The principal, if not only use at present, is for caulking, and for this purpose it is mixed with earth oil or *Petroleum*. The method is to boil the *Pwai-nget* in water, which makes it quite soft, and then to knead it with a certain quantity of petroleum until it attains the consistency of a lump of putty, which it much resembles. In that state it is fit for use and is extremely viscid and tenacious. . . . It is soluble in oils and in turpentine, but not in spirits of wine."

BOMBUS EXIMUS, Smith.	Tenasserim.
" MONTIVAGUS, Smith.	Tenasserim.
" IMPETUOSUS, Smith.	

The females of two or three species of carpenter bees may be frequently seen excavating their cells in the cavities of bamboos, or chiselling for themselves tunnels in decayed wood. When the shaft is sufficiently deep, they deposit their eggs, and balls of nutriment for the grubs; then floor over the orifices with mud, and lay again, and so continue to do until they have deposited all their eggs.

These insects fly into houses, and Europeans call them bumble bees, but they belong to a tribe of solitary bees (*Xylocopa*), of which no species are found in England.

XYLOCOPA TENUISCAPA, Westw.	
" LATIPES, Drury.	Tenasserim.
" ÆSTIVANS, L.	Tenasserim.
" COLLARIS, St. Farg.	Tenasserim.
" AMETHYSTINA, Latr.	Tenasserim.
MEGACHILE DIMIDIATA, Smith.	Tenasserim.
CROCISA DECORA, Smith.	Yunan.
ANTHOPHORA ZONATA, L.	

## CONCHIOLOGY.

THE list of shells given by Dr. Mason was a very meagre one, and may be regarded as wholly superseded by later researches. To Dr. Mason belongs, however, the credit of being the first to pay attention to the land and freshwater shells of Burma, and so far back as the year 1842 he despatched a collection of shells to Dr. Gould, of Boston, the majority of which were undescribed, and which gave the first hint of the extraordinary richness and interest of the Burmese shell fauna. The entire number, however, of shells indicated by Dr. Mason, both land and marine, was less than 150, and of these only a moiety can be regarded as specifically determined. The following species are mentioned by Dr. Mason as being used for food by the Burmese, who, it may be remarked, will, on a pinch, eat almost anything that the human masticatory organs can dispose of. The *Teredo* found in wood is, Dr. Mason says, collected and sold in the bazaars, and is considered very good eating, as are the burrowing shells *Pholas*, *Dactylina* and the like, and the Tellens and Razor shells. More commonly, because more plentiful and accessible, the estuarine forms of *Area* and different species of *Cardium* and sundry *Veneracea*. "A large species of mussel may be sometimes seen in the bazaar, where it sells for a comparatively high price, being regarded by the natives as the best eating of any shell fish in the country." This is *Mytilus smaragdinus*, and *Hiutula diplos* is almost equally esteemed. In the following list the nomenclature of the "Genera of Recent Mollusca," by H. and A. Adams, has been usually followed, with the adoption, however, in many cases of the genera of Lamarck instead of some older and less familiar ones. One important deviation from Adams' arrangement should, however, be mentioned, viz. the removal of the operculated pulmonata from their place in the sub-class Pulmonifera to the sub-class Prosobranchiata, in the vicinity of the pulmonate *Ampullaridae*.

Those species marked \* were collected by myself on the Arakan coast, between Sandoway and Cape Negrais, and the specific names were kindly furnished to me by Sylvanus Hanley, Esq., who remarked that the names are not always those which claimed priority, but only that the shells corresponded with the specific reference quoted. The remaining shells are added mainly on the authority of Messrs. G. and H. Nevill, E. E. Smith, and W. T. Blanford. The present list, however, is merely given in default of a better, and makes no pretence of fully representing the rich molluscan fauna of the east side of the Bay of Bengal and its islands. The list is largely composed of species obtained along the coast, and a few months' careful dredging would no doubt go far towards doubling the number of species here recorded. Any one desirous of collecting shells will find great assistance and encouragement from the perusal of any of the following books:—Woodward's Manual of the Mollusca; The Genera of Mollusca, by H. and A. Adams; Chenu's Manuel de Conchyliologie, or Sowerby's 'Thesaurus Conchyliorum.'

## Sub-Kingdom VI. MOLLUSCA.

Soft-bodied unsegmented animals, with or without an external or internal "shell." A stomach, intestine, and both oral and anal orifices. Sexes distinct or united. Reproduction by ova, but animals sometimes viviparous. The teeth are minute, siliceous, and ranged symmetrically on the 'lingual ribbon,' radula or 'odontophore,' as it is more properly called. They are beautiful objects under the microscope, and of value in classification.

### Class BRACHIOPODA.

Bivalves. Valves unequal, upper and lower, not right and left, as in ordinary bivalves; no elastic ligament, and lower valve often perforated apically to allow the passage of a tendinous peduncle for attachment to fixed substances. Gills none. Radula none. A pair of ciliated oval arms, whereby food is obtained, but which are not extensible beyond the shell.

#### Family Craniidæ.

CRANIA STELLA, Reeve.

#### Family Lingulidæ.

LINGULA HIAN, Swainson.

The Andamans.

Of this species Capt. Wilmer writes (Proc. Zool. Soc. L. 1878, p. 820): "It lives in mud or sandy clay at low-water mark, the shell being buried about a foot from the surface. It is very easily alarmed, and retreats rapidly downwards. In order to collect specimens I searched for oval orifices in the mud, and having found one, a spade was plunged very deeply in, and the mud turned over, the hands then being used to go deeper; yet still in many cases the creature was too quick for the diggers."

„ (sp. near *Anatina*).

A species of *Lingula* is sometimes brought for sale as food, to the Akyab bazaar and merits our respect, for its ancient lineage, belonging as it does to a genus, which may be said to have witnessed the dawn of life in the seas, and compared with which man's birth on the planet is an event of yesterday.

### Class LAMELLIBRANCHIATA.

Bivalves. Valves equal or unequal. Respiration by means of lamelliform branchiæ. Radula none. Sexes distinct. The shells of females are often more swollen than those of males, from the greater space required for their enlarged ovaries. This disparity is sometimes so great in some *Uniones* as to have led to the sexes being specifically separated.

The young are hatched within the body of the parent, and are discharged in cloud-like swarms of tiny creatures, to seek each its own living. The embryos at first swim freely about, in which stage they represent the permanent condition of the *Iteropoda*, but soon dropping their filamentous organs of motion, as tadpoles do their tails, they either attach themselves permanently to any convenient roosting-place within their reach, as *Ostrea* or *Chama*, moor themselves securely by a 'byssus' or cable, like *Pinna* or *Mytilus*, or lead a free and roving life like *Cardium* or *Unio*. "The body of the bivalve Mollusca is enveloped in a muscular mantle, which is usually more or less united at the margins, forming a branchial cavity with three openings, a pedal, a branchial or inhalent, and an excretory or anal, the pedal orifice being situated anteriorly, and the others towards the hind part. The mantle secretes the shell, the interior of which it lines, and to which it is fixed by the adductor muscles, which pass through it to be attached to the body of the animal." (Adam, 'Genera,' Vol. II. p. 318.) In some genera, as *Ostrea*, the mantle is open,

and there are no distinct pallial orifices; in other genera, as *Cardium*, the orifices of the mantle are prolonged into tubes, which in some cases are very extensile and exceed the shell in length. The length of these tubes or siphons, as they are called, may be estimated by the size and length of the siphonal scar on the shell, which is always proportionate to that of the tubes themselves, and is longest in such burrowing forms as *Mya* and *Scrobicularia*. Respiration is carried on by vascular lamellæ or gills, through which the water taken in by the inhalent orifice is passed, being at one and the same time dispossessed of its oxygen and such organic or other matter as it may hold in suspension, and which serve as nutriment for the animal, and it is surprising how soon and how effectually a group of healthy active bivalves will clear a mass of turbid water (stained say with clay or any harmless pigment) by straining it through their siphons and gills. If any particle of a noxious substance, however, is held in such a position as to be drawn into the inhalent orifice, the injured animal at once closes its valves with a snap, producing a violent jet of water, with which the offending substance is expelled.

Locomotion is mostly performed by means of the foot, though some bivalves progress by opening and closing their valves, as the ‘Pectens,’ and the foot is also the organ by means of which burrowing shells excavate their residence in rock or wood, usually by means of the rugose surface of the valves, as in *Pholas*, which being rotated by the muscular foot, rasp the rock like a file. In some cases, however, the action would seem to be other than mechanical, and either the result of an acid secretion or perhaps merely the carbonic acid produced by respiration. In the former case any substances less hard than the valves can be attacked and perforated, in the latter calcareous rocks only.

#### Order ASIPHONATA.

Respiratory siphons none or rudimentary. Mantle lobes free.

Many of this order are fixed by their shell and incapable of locomotion, save in their earliest stage, as *Ostrea* and *Chama*; others are moored by a byssus, as *Mytilus* and *Pinna*; whilst others, as *Unio* and *Trigonia*, move freely, the latter animal being very active and capable of leaping (when out of water) some distance.

#### Family Anomiidæ.

Byssus large and passing through a nearly complete foramen through the right mantle lobe and a hole in the lower valve.

The shells of *Anomia* are thin, and often take the form of objects to which they are attached. The byssal plug is calcareous, and the upper shell has three muscular scars.

ANOMIA ENIGMATICA, Chem.

\* „ ELECTRINA, Chem. non L.

\* „ SOL, Reeve.

#### Family Placunidæ.

Shell subnacreous. Hinge formed of the divergent ridges. Shells free, buried erect in sandy mud.

Hinge ridges gradually diverge, the hinder much the longer. Shell semi-transparent.

\*PLACENTA PLACENTA, L.

This is the ‘window oyster,’ so called from its valves being transparent like tale.

#### Family Ostreidæ.

\*OSTREA CUCULLATA, Bom.

The ‘Ladies slipper’ oyster or ‘Jinjouk’ of the Burmese. This is the species which crusts the surf-beaten rocks off the coasts of India and Burma, giving them

the appearance of a cake covered with a coat of white sugar. This oyster is edible and pleasant when it has been gathered from spots freely covered by the waves, but is very apt to prove unwholesome, if not poisonous, when gathered from spots where it is left exposed to the sun and air for several successive hours. In some spots on the Arakan coast I have noticed this species growing where in my opinion it could never have been submerged for more than two or three hours consecutively by spring-tides, and must have remained for perhaps days without opening its valves, save to receive casual spray.

\* „ *CIRCUMSUTA*, Gould.

\* „ *NIGROMARGINATA*, Sow.

The specimen figured under this name in the *Conchologia Iconica*, Pl. xxxiii. 84, was obtained by myself between tide-marks on the Arakan coast near Baumi. It occurs sporadically on the rocks, and some specimens are barely distinguishable from the European *O. edulis*. It is in my opinion a dwarf variety of the next species, reduced in its proportions by the fact of its growing in spots unsuited to it, that is, between tide-marks.

The Burmese call these middle-sized oysters 'kamch.'

\* „ *TALIENWAHENSIS*, Crosse (?).

The 'creek' or 'rock-oyster' or 'kamā' of the Burmese.

This species, which much resembles the fossil *O. lingula*, Sow., was doubtfully referred to Crosse's species by my deceased friend Dr. F. Stoliczka. It attains to nearly a foot in length, and flourishes in compact masses just below the level of low spring-tides, during which period it is sought for by men armed with iron bars to detach it from its anchorage. As food, this species is wholesome and good, but rather too large to bring uncooked to table; but if not so slightly as the smaller species, it may be always more thoroughly relied on (*vide* Theobald, Raised Oyster Banks, Records, Geological Survey of India, vol. v. p. 111).

\**LOPHA HYOTIS*, L.

Cockscorb oysters. Shell strongly ribbed.

### Family Spondylidæ.

Shell irregular, attached by the right valve; ribbed, spiny or foliaceous. Teeth two in each valve. Ligament internal.

Cardinal area divided by a groove and enlarging with age.

\**SPONDYLUS COCCINEUS*, Lam.

\* „ *LONGISPINA*, Lam.

\* „ *ZONALIS*.

Cardinal area indistinct.

\**PLICATULA DEPRESSA*, Lam.

\* „ *AUSTRALIS*, Lam.

### Family Pectinidæ.

Foot small, cylindrical, with a byssal groove. Ligament wholly or partly internal.

*PECTEN*.

Shell equivale, ribbed. The anterior auricle larger, the right one with a byssal sinus. The foot is used chiefly as an exploring organ, and to anchor the animal when required, by a temporary byssus. The young swim freely in a zigzag manner by opening and snapping their valves. (Adams.)

\* „ *SUPERBUS*, Reeve.

\* „ *PALLIUM*, L.

*CHLAMYS ALBOLINEATUS*, Sow.

Andamans.



## JANIRA.

Shell inequivalve, ribbed, the upper valve flattened. Auricles subequal.

\* .. HISTRIONICUS, Gmel.

\* .. PYXIDATUS, Born.

## AMUSSIUM.

Shell subequivalve, orbicular, thin, gaping, smooth.

\* .. PLEURONTIUS, L.

Family **Vulsellidæ.**

## VULSELLA.

Anterior adductor muscle none.

\* .. LINGUA-FELIS (?), Reeve.

Family **Aviculidæ.**

Shell inequivalve, pearly within, with a prismatic cellular layer, and nacreous lustre.

## MELEAGRINA.

Shell orbicular. Right valve with a byssal sinus. Hinge linear, edentulous.

\* .. MARGARITIFERA, L.

The 'Pearl oyster' occurs along the coast of Arakan, and 'banks' of them would no doubt be found if proper search was made. Any shell, however, whose interior coat displays a fine nacreous lustre is capable of producing pearls, which are merely a deposit of the lustrous lining material of the shell round some foreign and offending object, and in Europe pearls are found in the river mussel *M. margaritifera*, L. Black pearls are occasionally produced by a species of *Pinna*, and a pink pearl by the giant stromb of the West Indies. In China one or more species of *Unio* and *Anodon* are employed as pearl-makers, being domesticated in ponds, and sundry foreign substances introduced within their valves, which the occupant coats over with a thin film of 'pearl.' Among others, small metal images of Buddha are introduced, and in the course of some months are removed as 'idol pearls,' which meet with a ready sale at moderate prices. There is nothing in the nature of a 'pearl oyster' to render it more difficult to breed and rear than the common edible oyster, but a trial can alone determine whether banks of pearl oysters could be artificially formed and worked to a profit.

## PERNA.

Hinge area wide, with numerous transverse elongated cartilage-pits.

\* .. EPHIPPICUM, L.

\* .. SULCATUS, Lam.

\* .. EREMITA, Gould.

Shell strong.

\* .. VULSELLA, Lam.

.. SAMOENSIS, Boisd.

Andamans.

## MALLEUS.

Shell subequivalve, greatly elongated at the base. Beaks small, central. Hinge straight, edentulous, eared, with a long cartilage-pit under the beaks. The peculiar elongation of the shell is developed as the animal attains maturity, and is inconsiderable in young shells.

.. sp.

A species of 'hammer oyster' is sometimes met with, but has not been determined.

## PINNA.

Shell triangular; equivalve, inequilateral, more or less fragile, and attached by a long silky 'byssus' to fixed objects. This 'byssus,' when cleaned and combed, is capable of being woven into such articles as gloves or socks, and is one of the warmest materials known. It is, however, too scarce to be ever more than a mere curiosity.

\* „ CHEMNITZII, Hensley.

\* „ VIALLEUM, Bom.

*Family Mytilidæ.*

Shell edentulous, moored by a 'byssus,' or filamentous cable, to fixed objects. The animals of the genus *Mytilus* are prized as food, though occasionally in Europe the 'common mussel' has proved poisonous, for some reason which is not well understood. It is most probable, however, that the animals which occasionally have given rise to unpleasant symptoms have been exposed to some injurious influence, such as a sewage diet, or impure water, which may have engendered an unhealthy diathesis, causing their unfitness for food. It is also known that some men have a peculiar bodily idiosyncrasy which prevents their eating any sort of shell-fish or even *Crustacea* without suffering severely. The occasional unwholesomeness of mussels has also been referred to the presence of a minute crab, living parasitically within its valves (and observed by me in the case of *Cyrenæ*), but this is not very probable.

\**MYTILUS SMARAGDINUS*, Chem.

This is a large handsome mussel of a dark apple green, and is highly esteemed as food.

\**CRENELLA*, sp.

## MODIOLA.

Shell equivalve, inequilateral, anterior side very short.

The *Modiolæ* differ from the 'mussels' in being burrowers, and often construct a nest for themselves of bits of stones and shells, which they spin together with their byssal threads.

\* „ METCALFEI, Hanley.

\* „ STRIATULA, Hanley.

\* „ TRAILLI, Reeve.

\* „ MARGINATA, B.

Estuaries. Also Hugli River.

*Family Arcidæ.*

Foot large, oblong. Shell not pearly within. Hinge with numerous interlocking or pectinate denticles.

*Sub-family ARCINÆ.*

Foot with a byssal groove.

The *Arceæ* are variable in their habits, some mooring by a byssus, or nestling in holes, whilst others are free and move about the mud of estuaries. These last are much sought for food.

\**ARCA TORTA*, Mörch.

\* „ RHOMBEA, Born.

\* „ TENEBRICA, Reeve.

\* „ IMBRICATA, Brug.

\* „ DECUSSATA, Reeve.

\* „ FUSCA, Brug.

\* „ LABIATA, Reeve (non Sow.)

\* „ DISPARILIS (?), Reeve.

\* „ PECTINUCULOIDES, Hanley MS.

\* „ MYRISTICA, Reeve, A.

\* „ GRANOSA, L.

Irrawaddy Delta.

*Scaphula, Benson.*

Shell thin, equivalve very inequilateral, hinder slope keeled, covered with a smooth epidermis. Animal byssiferous, and nestles in cavities in stones in freshwater or tidal streams.

*	„	PINNA, B.	Tenasserim River (within the tideway).
*	„	DELLE, W. Blanford.	Irrawaddy Delta.

*Sub-family AXINEINÆ.*

Foot without a byssal groove.

*Pectenulus, Lamarck.*

Shell equivalve and equilateral, with prominent ribs. Hinge curved, teeth pectinate.

*	„	CASTANEUS, Lam. (Reeve).	
*	„	PLANATUS, G. and H. Nevill.	Andamans.
		LIMOSIS COMPRESSA, G. and H. Nevill.	Andamans.

*Family Nuculidæ.*

Foot compressed, deeply grooved and forming when expanded an ovate disk with a serrated margin. Shell pearly.

Hinge-line angulated, with a prominent internal cartilage-pit at the angle. Teeth pectinate. Shell nacreous.

*	NUCULA	MIRABILIS, Hinde.
„		TURGIDA, Gould ( <i>vide</i> Mason).

*Family Unionidæ.*

Shell equivalve. Foot large, not grooved. The branchial or inhalent region fringed with cirri, the exhalent simple. Inhabits fresh water.

The head-quarters of *Unio* are North America, from which country upwards of 590 species had been described by Lea up to 1867, and after every deduction has been made for undue multiplication of species, North America will still stand unrivalled not only in the number but in the beauty of the species tenanted its waters. In some species of *Unio* the form of the male and female shells is different, but this peculiarity is not seen to any marked degree in our Indian *Unios* beyond a greater tumidity of the shells in females, the result of the larger space required in that sex for their gravid ovaries. The young *Unio* is matured and hatched within the mantle of its parent. The amount of young matured in a season by a single specimen of *Anodonta* was estimated at 600,000 by Lea, and may be perhaps put at something less for *Unio*; still the numbers are enormous, though only a small per-centage eventually attains to maturity. *Unio* is one of those genera which, it has been remarked, seem created for the amusement of species-makers, and it has long seemed to me desirable to group the different races, the result of different climatal and other surroundings, round a type species, to which they seem nearest allied, or whence derived; thereby breaking up this overgrown genus into manageable groups, each group in reality representing one species, with its associated or derivative races or sub-species. By following this plan we have in Burma six species, embracing over 20 so-called species or races already ascertained, and some probably yet to be discovered.

What some naturalists would seem to understand by species is not easy to understand. C. Wyville Thomson, after sneering, in his preface to "The Depths of the Sea" (p. 11), at the Darwinian doctrine of descent by modification of one species from another as "only a hypothesis," goes on to add: "During the whole period of recorded human observation not one single instance of the change of one species into another has been detected; and singular to say, in successive geological formations, although new species are constantly appearing, and there is abundant

evidence of progressive change, no single case has yet been observed of one species passing through a series of inappreciable modifications into another." Now what this passage means, I know not, if it is not an assertion which is contradicted in the most absolute manner by the plainest deductions of zoology. The zoologist's one difficulty is with those species which vary so by "inappreciable modifications" that it is impossible to say where one species ends and another begins—and this variability is the very mode whereby under favourable conditions one species does (so to say) pass into another. As for the geological phase of the question, it may be met by quoting the case of the living Wild Buffalo (*Bubalus Arni*), and the living Indian Elephant (*Elephas indicus*), which can hardly be descended from any stock save the Siwalik *Bubalus palvindicus* and *Elephas hyrudricus*, and although this may be stigmatized as "only a hypothesis," it is a hypothesis infinitely less absurd than the only alternative one, namely, that these forms so nearly related to extinct Siwalik species are not really descended from them, but were independently elaborated *de novo*. The idea is one we are familiar with in the writings of poets and other holy and unholy men, and certainly lends itself to a good deal of pretty writing, as, for example, those charming lines on the *Creation* by Vincent Bourne:

"Ecce! iterum terræ pariunt et fusa per agros  
Undique depascunt virides animantia campos.  
Reptilium innumere gentes, quas fertile verbum  
Produxit, vitam accipiunt, initumque movendi.  
Immanes surgunt tigres rabidique leones  
Cornigerique boves distentaque lacte capella.  
Ecce! novis tremulum diverberat aera pennis  
Alituum genus et multo super Æthera plausu  
Fertur, et undantes implet concentibus auras."

Now this, as poetry and a creation of the fancy, is beautiful, but as a scientific utterance or physiological canon is simply "bosh."

a. *Marginalis group.*

UNIO MARGINALIS, Lam.	
„ GRESUS, Hanley and Theobald.	Toung-ngoo.
„ CORRIEANUS, Lea.	Pegu.
„ GEXEROSUS, Gould.	Pegu.
„ SCUTUM, B.	Tenasserim R.

b. *Corrugatus group.*

„ CORRUGATUS, Müll.	
„ FEDDENI, Theob.	Bhamo.
„ LUTEUS, Lea.	Newville (Tavoy).
„ TAVOYENSIS, Gould.	Pegu and Tenasserim.
„ <i>Parma</i> , B.	
„ BURMANUS, W. Blanford.	Bhamo. Mandalay.
„ BIAMOENSIS, Theob.	Bhamo. Mandalay.
„ <i>Mandelayensis</i> , Theob.	
„ VULCANUS, Hanley.	

c. *Caruleus group.*

„ CERULEUS, Lea.	
„ ANDERSONIANUS, G. Nevill.	Myadoun.
„ BONNEAUDI, Eydl.	Pegu. Upper Burma.
„ CRISPATUS, Gould.	Tavoy.

d. *Crispisulcatus group.*

„ CRISPISULCATUS, B.	Pegu.
----------------------	-------

e. *Pugio group.*

„ PUGIO, B.	Pegu. Bhamo.
-------------	--------------

f. *Foliaceus group.*

UNIO FOLIACEUS, Gould.	Tavoy. Pegu.
<i>Peguensis</i> , Anthony.	
,, EXOLUSCENS, Gould.	Tavoy.
,, FRAGILIS, G. Nev.	Yaylaymaw. Upper Burma.
MONOCHONDYLEA, D'Orbigny.	

This genus is readily discriminated from *Unio* by the teeth being smooth and tangential, not serrated and interlocking, as in that genus. In habits they resemble *Unio*, with which they are associated in the hill streams.

* ,, SALWENIANA, Gould.	Pegu. Salween R.
* ,, INOCTULARIS, Gould.	Pegu. Salween R.
* ,, CREBRISTRIATA, Anthony.	Pegu.
<i>Peguensis</i> , Ant.	
,, AVE, Theob.	Mandalay.

A single species of Conrad's genus *Solenaria* (*S. soleniformis*, B.) has been found in Kachar, and may possibly be discovered in Arakan; but the most promising ground for future discoveries lies between Maulmain and Zimmay, where some species of *Unio* occur almost rivalling in size the largest American species.

## Order SIPHONATA.

Respiratory siphons more or less well developed.

Family **Chamidæ.**

CHAMA, *Bruguères*.

Shell inequivalve, fixed by one valve. Teeth two in one valve, one in the other. Beaks recurved, unequal.

* ,, LAZARUS, L.
* ,, GRYPHOIDES, Chem. (non L.).
* ,, SQUAMOSA, Chem.

TRIDACNA GIGAS, L.

Shell inequivalve, triangular, inequilateral, ribbed, margins dentate. A single primary tooth in each valve, and two lateral teeth in one valve and one in the other. Byssal orifice large. Shell dense, and so calcified as to almost obliterate all traces of organic structure (Carpenter).

The giant clam inhabits coral reefs, and large individuals seen through the clear water, through the sinuous gape of their shells, look like dark serpents. Aged individuals cannot close their valves, and are said to grow to upwards of 500 lbs. Their flesh is not exactly inedible, but is stinging and peppery to the taste, and probably unwholesome if freely partaken of.

HIPPOPUS, *Lamarck*.

This shell differs from the last by the absence of the byssal foramen, and by its double primary tooth.

Family **Cardiidæ.**

Foot very long and bent. Shell regular, equivalve. Hinge composed of two oblique primary teeth in each valve and two elongate lamellar laterals. Ligament short, external, conspicuous.

CARDIUM, *Linnaeus*.

* ,, RUGOSUM, Lam.
* ,, ASIATICUM, Chem.
* ,, FIMBRIATUM, Wood.

*CARDIUM ELONGATUM, Lam.	
* .. PAPHIACUM, Chem.	
* .. LATUM, Gmel.	
* .. APERTUM, Chem.	
* .. MULTISERIATUM, Sow.	
* .. <i>maculosum</i> , Reeve.	
(CHELOCARDIA) HYSTRIX, Reeve.	Andamans.
* .. AUSTRALE, Sow.	Andamans.
HEMICARDIA ORIENTALIS.	Andamans.
(LUNULICARDIA) REFUSA, L.	

#### Family Lediidæ.

Foot compressed, deeply grooved, forming when expanded an oval disk with crenate edges. Siphons long, slender and completely retractile. Shell thin, pearly.

\*LEDA NICOBARICA, Chem.

#### Family Lucinidæ.

Foot cylindrical, hollow, opening into the visceral cavity. Muscular scars very large, rough and elongated.

*LUCINA, sp. (near ROTUNDATA).	
* .. sp. (near SERICATA).	
* .. sp. indet.	
* .. sp. indet.	
*LORIPES PHILIPPINARUM, Hanley.	
* .. PHILIPPIANA, Reeve.	
CORBIS FIMBRIATA, L.	Andamans.

#### Family Cyrenidæ.

Siphons short. Shell orbicular, closed, covered with a brittle epidermis. Cardinal teeth two or three, lateral teeth compressed. Ligament external.

CYRENA, *Lamarck*.

Shell inequilateral, beaks eroded, lateral teeth smooth. Inhabits salt or brackish water.

\* .. BENGALENSIS, Sow.

The species of *Cyrena* are found in mangrove swamps and estuaries. In Burma they are frequently tenanted by a small globular crustacean, about the size of a pea, always found living in pairs, parasitically inside the valves, without any apparent inconvenience to its host.

CORBICULA, *Megerle von Muhlfeldt*.

Hinge, with three cardinal teeth in each valve. Lateral teeth striated. Ligament prominent. Beaks sometimes eroded. Inhabits fresh water.

The rivers of India and Burma contain several species of *Corbicula*, but there is no doubt that the number of species of this genus have been unduly multiplied. All here enumerated are strictly river forms.

.. GRACILIS, Prime.	Tenasserim R.
.. <i>acuta</i> , B.	
.. PISUM, W. Blanford.	Ava.
.. LAMARCKIANA, Prime.	Mandalay. Momein.
.. YUNANENSIS, G. Nevill.	Manwyne in Yunan.
.. ANDERSONIANA, G. Nevill.	Momein in Yunan.
BATISSA INFLATA, Prime.	The Nicobars.
SPILERIUM AVANUM, Theob.	Ava.

*Family* **Astartidæ.**

Foot conical, compressed. Hinge with strongly developed cardinal teeth. Pallial line entire or but slightly indented. Shell thick, often concentrically ribbed.

CRASSATI LIA, *Lamarck*.

Shell solid, equivalve, attenuated behind. Ligament internal. Teeth two primary and one lateral in each valve.

\*,,, RADIATA, Sow. Andamans.

CARDITA, *Lamarck*.

Shell corlate, equivalve, inequilateral, radially ribbed. Lateral teeth none.

\* „ BICOLOR, Lam.

\* , , p. 104, Reeve.

*Family* Veneridæ.

Siphons short, unequal. Foot large, linguiform, compressed.

*Sub-family* VENERINÆ.

VIRUS, *Linnaeus*.

Foot lanceolate, without a byssal groove. Siphons divergent, the branchial, with a double row of cirrhi; the anal conical, crowned with short cirrhi. Shell thick, tumid, margin crenulated. Hinge with three teeth in each valve. Pallial sinus short. Animals burrow in the sand and are collected for food.

\* ,, CHUMNITZII, Hanley.

\*, ARAKANA, Hanley MS.

\* cor, Reeve.

This species is an estuarine form.

,, AFFINIS, Sow. Andamans.

ALABASTRUM. Andamans.

CRYPTOGRAMMA ARAKANA, G. and H. Nevill.

\*CHONE COCHINENSIS, Sow.

,, Ceylonensis, Sow. Irrawaddy Delta.

\* ,, CALOPHYLLA, Hanley.

\* RADIATA, Chem.

\* THIAKA, Wood.

\*,, NEBULOSA, Lam.

" *pinguis*, var. Chem.

\*CYTHURA MERETRIX, Lam.

\*,, IMPUDICA, Lam.

\**CALLISTA ERYCINA*, L.

\* „ KINGII, var. NICOBARICA (Sow. Thes.).

\*SUNETTA BURMANICA, Phil.

\*, , SCRIPTA, L.

\*,, PICTA, Lam.

\* ,, EXCAVATA, Hanley.

\*CIRCE GIBBIA, Lam.

\* „ SCRIPTA, I.

\* „EQUIVOCA, SOW.

\* „ PLACUNELLA, Lam.

\* DIVARICATA, Chem. (non Sow.).

*Sub-family* DOSINIINE.

Shell orbicular. Pallial sinus oblique, deep, pointed.

*DOSINIA, Scopoli.*

Shell concentrically striated or scabrous, deeply lunulate under the beaks. Hinge with three teeth on each valve. Ligament external. "While in *Venus* and its sub-genera we find the cancellated or festooned style of ornament to predominate, and in *Meretrix* the smooth and painted style to prevail, the surface of the valves in *Dosinia* is usually concentrically grooved and of a white or pale colour" (Adams).

- \* ,, *EXCISA*, Chem.
- \* ,, *JUVENILIS*, Gmel.
- \* ,, *SCABRUSCULA*, "Phil." Reeve.
- \* ,, *LAMINATA*, Reeve.

*CLEMENTIA, Gray.*

Shell equivalve, inequilateral, subtrigonal, white, thin. Pallial sinus ascending nearly as far as the beaks.

- \* ,, *SIMILIS*, Sow.

*Sub-family TAPESINÆ.*

Foot lanceolate, byssiferous.

*TAPES*, *Megerle von Muhlfeldt*.

Siphon united half way, ends divergent. Shell ovate, equivalve, inequilateral, closed, margins entire.

- \* ,, *SEMIDECUSSATA*, Reeve.
- \* ,, *PAPILLIONACEA*, Lam.
- \* ,, *UNDULATA*, Born.

*VENERUPIS, Lamarck.*

Foot small, linguiform, byssiferous. Shell ovate or subglobose, inequilateral, gaping posteriorly. Three teeth in one valve, two in the other. Ligament external.

- \* ,, *MONSTROSA*, Chem.
- \* ,, *MITIS* (?), Sow.
- \* ,, *IRUS*, L. ("precisely the Mediterranean form," Hanley).
- \* *CYPRICARDIA ANGULATA*, Lam.
- ,, *SPATHULATA*, Sow. Andamans.
- \* ,, *VELLICATA*, Reeve.
- \* *CORALLIOPHAGA CORALLIOPAGA*, Gmel.

*Family Mactridæ.*

Siphons united to their ends, which are surrounded by simple cirrhi. Foot lanceolate, subanterior. Shell equivalve. Hinge with two cardinal teeth in each valve, the hinder small or rudimentary. Lateral teeth in the right valve double, in the left single. Ligament internal. Pallial sinus distinct.

- \* *TRIGONELLA VIOLACEA*, Gmel.
- \* ,, *ADANSONI*, Reeve.
- \* ,, *CUNEATA*, Chem.
- \* ,, *ANTIQUATA*, Spengl.
- \* ,, *TURGIDA*, Gmel.
- \* ,, sp. (near to *TURGIDA*.)
- \* ,, *PELLUCIDA*, Chem.
- \* ,, *CAPILLACEA*, Reeve.
- \* ,, *ÆGYPTIACA*, Dillwyn.
- \* ,, *COMPLANATA*, Desh.
- \* ,, *FLICATA*, L.
- \* *OXYPERAS TRIANGULARIS*, Lam.
- \* *LUTRARIA PLANATA*, Chem.
- \* ,, *ELONGATA*, Gray.



*Family Tellinidæ.*

Siphons very long, slender, divergent and separated for their entire length. Foot compressed, linguiform bent. Shell free. Hinge with two cardinal teeth at most in each valve. Ligament on the shorter side of the shell.

*Sub-family TELLININÆ.*

Shell compressed, gaping posteriorly.

*ASAPHIS*, *Moder.*

Valves radiately ribbed or striated. Ligament external, large.

- \* „ *DEFLORATA*, L.
- PSAMMOBIA MALACCANA, Reeve.
- „ *ARAKANA*, Hanley MS.
- \* „ *VIOLACEA*, Lam.
- \* „ *TRIPARTITA*, Reeve.
- „ *carulescens*, Lam.
- PSAMMOCOLA) *TOGYTA*, Reeve.
- \* *HIAITLA DIPHOS*, L.

This species abounds in backwaters along the coast of Burma, and is eagerly sought for as food. A man walks along the stream, scrutinizing the sand, till he perceives the key-hole (so to say) which marks the retreat of the wily *diphos*. A thin strip of bamboo, with a cordate extremity, is now thrust down, and passes right through the body of the animal, whose position is of course a vertical one. The valves are at once forcibly closed, and little difficulty is now experienced in hauling forth the coveted prize. W. Blandford describes it as burrowing *four* feet and having siphons longer than the shell (J.A.S.B. 1867, Part ii. p. 69).

- \* „ *ATRAVA*, Born.
- TELLINELLA, *Gray.*
- \* „ *FRISTIS*, Lam.
- \* „ *STRIATULA*, Lam.
- \* „ *REMIES*, L.
- \* „ *GUINACA*, Chem.
- \* „ *POLYGONA*, Chem.
- \* „ *PHILIPPINARUM*, Hanley.
- \* „ *ROSEA*, Hanley.

Sub-genus *MERA*, *H. and A. Adams.*

„ *RHOMBOIDES*, Quoy and Gaim. Andamans.

- \*TELLINIDES PLANISSIMA, Anton.
- \* „ *LANCULATA*, Gmel.
- \* „ *TRUNCATULA*, Sow.
- \* „ *CONSPICUA*, Hanley.

- \*MACOMA ALA, Hanley.
- „ *BIRMANICA*, Phil.

*Sub-family DONACINÆ.*

Siphons short, divergent. Ligament external, short.

*DONAX*, *Linnaus.*

Shell strong, cuneiform, equivalve, inequilateral, the hinder portion shorter than the anterior. Two cardinal teeth in one valve and a bifid one in the other. Pallial sinus wide and deep.

- \* „ *CUNEATUS*, L.
- \* „ *RADIATUS*, Schroeter.
- \* „ *BICOLOR*, Lam.
- \* „ *DYSONI*, Desh.
- \* „ *INCARNATUS*, Chem.
- \* „ *SCORTUM*, L.

*Sub-family* SCROBICTARIINE.

Shell thin, subequivalve, gaping, and often flexuous posteriorly. Ligament internal.

SCROBICTARIA, *Schumacher*.

Hinge with one or two teeth in each valve, and an internal spatulate cartilage-pit. Pallial sinus large.

"In this genus the orifices of the siphons are plain, the mantle is denticulated, and the foot is large and compressed. The animals usually live buried vertically five or six inches deep in the mud of tidal estuaries; the siphons can be extended five or six times the length of the shell." (Adams.)

- \*       ,,       CORDIFORMIS, Chem.
- ,,       ANGULATA, Chem.

*Sub-family* PAPHINE.

MESODESMA, *Deshayes*.

Shell ovate, subequilateral. Hinge with the lateral teeth, short, subequal. A single primary tooth, and a rudimentary process in place of a second. Ligament in an internal pit. Epidermis greenish-brown.

- \*       ,,       INTERMEDIA, Reeve.
- \*       ,,       OVATA, Reeve.

*Family* Solenidæ.

Foot large, elongated, thick, not byssiferous. Shell elongated, equivalve, and gaping at both ends. Hinge with two or three compressed teeth in each valve, the hinder one bifid. Ligament large, external, supported on a prominent shelf.

These shells, or "Razor fish," as they are called, live vertically buried in sand. They are sensitive, timid, and difficult to capture, but are good eating. They may be sometimes forced to ascend to the surface by putting salt in their holes, but they must be cleverly caught, or they will descend if frightened, and no additional salt on their tails will persuade them to come up again.

SOLENS, *Linnaeus*.

Shell straight, margins parallel, beaks gaping, terminal. Ligament long, external. Pallial sinus short, square.

- \*       ,,       BREVIS, Gray.

CUTELLUS, *Schumacher*.

Shell rounded and gaping at each end. Beaks subanterior, supported internally by an oblique rib.

- \*       ,,       CUTELLUS, L.

SILIQUA, *Meyerle von Muhlfeldt*.

Shell curved, oblong, polished, gaping at the ends, and strengthened internally by an elevated umbonal rib.

- \*       ,,       RADIATA, L.

SOLECURTUS, *Blainville*.

Shell compressed, rounded, and gaping at the ends. Hinge with two diverging primary teeth in each valve.

- \*       ,,       CONSTRUCTUS, Lam.
- \*       ,,       INFLEXUS, Wood.
- \*       ,,       NIVEUS, Desh.

*Family Glauconomyidæ.*

Foot moderately large, thick, compressed, keeled. Siphons very long. Shell oblong, thin, ventricose, covered with a green epidermis.

GLAUCONOMYA, *Brown.*

Hinge narrow, with three teeth in each valve, the middle teeth in the left and the hinder one in the right valve, bited. Ligament external. Pallial sinus deep. Inhabits fresh and brackish waters.

\*     ,,     CHINENSIS, Gray.

NOYACULINA, *Benson.*

Beaks subposterior. Shell covered with a thin wrinkled epidermis.

\*     ,,     GANGETICA, B.

This is a fresh-water species found in rivers above the tideway, but growing, I think, largest in mud banks within tidal influence.

*Family Corbulidæ.*

Siphons short, the anal furnished with a tubular retractile valve. Body unsymmetrical. Foot long with a byssal groove.

CORBULA, *Bruguère.*

Shell ovate, gibbous, very inequivalve, beaks prominent, valves concentrically striated. Hinge a recurved tooth in the right valve, received into a cartilaginous process in the left. Ligament small, internal.

   ,,     FORTISULCATA, E. A. Smith.     Andamans.

SPHERIA, *Turton.*

Shell oblong, inequivalve, produced and gaping posteriorly. Surface smooth or rugose, covered with an epidermis. Hinge a dilated laminar tooth in front of the oblique cartilage-pit in the right valve, with a corresponding pit in the left cartilage internal.

   ,,     PERVERSA, W. Blanford.     Irrawaddy Delta.

*Family Anatinidæ.*

Shell thin, nacreous, inequivalve. Hinge teeth rudimentary. Ligament external. Cartilage internal, in a pit in each valve, usually furnished with a free ossicle.

ANATINA, *Lamarck.*

Siphons long, covered with a rugose epidermis. Cartilage-pit in each valve spoon-shaped, projecting internally, furnished in front with a transverse ossicle.

\*     ,,     BOSCHASIANA, Reeve.

PANDORA, *Solander.*

Siphons very long. Shell thin, inequivalve, closed, pearly within. Right valve flat. Ligament internal. Hinge with a primary tooth in each valve with corresponding cartilage-pits, but no free ossicle.

\*     ,,     CLYLANICA, Sow.

*Family Gastrochænidæ.*

Siphons very long, united almost to their ends. Foot small, not byssiferous. Shell equivalve, valves gaping. Hinge rudimentary. Cartilage external, small, weak.

The *Gastrochænidæ*, together with the *Pholades*, constitute the *Tubicola* of Lamarck, a very natural group characterized by their living chiefly inclosed in tubes or burrows which they never leave. The valves of the shell are sometimes firmly

incorporated with the protecting tube, as in *Aspergillum*, or one valve only is free, as in *Clavagella*, or else both valves are free, as in *Gastrochena*. The tubes themselves are usually buried with the thickest end downwards in the mud or sand near low-water mark.

GASTROCHENA, *Lamarck* (not *Spengler*).

Shell with both valves free, cuneiform, equivalve, widely gaping in front, closed behind, valves very inequilateral. Ligament external. Tube calcareous, claviform, free or fixed. Valves free, widely gaping in front. The shells are often inclosed in strong flask-shaped tubes, attached to shells in which the animal burrows.

- \*     ,,     LAGENA, Lam.
- \*     ,,     APERTISSIMA, Desh.
- \*     ,,     CYMBIUM, Retz.

*Gastrochena munita*, Spengler, or the *Fistulana clara*, Lam., as it is generally called, is a curious shell, whose clavate tubes are found associated gregariously at low-water mark at Singapore and in the Eastern seas, the tips only of the tubes projecting, whilst their thick and closed ends are deeply buried in the mud.

ASPERGILLUM, *Lamarck*.

Shell small, oval, equivalve, glued to the walls of the tube, the umbones only being visible. Open posteriorly or above. Clavate anteriorly or below, and closed with a convex disk, pierced with tubular holes and with a minute central fissure, and a handsome peripheral ring of tubes. The upper or siphonal end plain or frilled.

- \*     ,,     SPARSUM, Sow.

The watering-pot shell.

Few people who have admired the curious tubular shell ending in a disk, pierced with holes like a garden watering-pot, are aware that the occupant and maker thereof is a *bivalve*. If, however, the head of the tube be carefully examined, the two tiny valves of the juvenile architect may be seen cemented into its wall.

### Family Pholadidæ.

Shell free, or within a tube, gaping at both ends. Thin, white, brittle, edentulous, armed anteriorly with rasp-like imbrications. Hinge fitted with accessory valves. Hinge plate reflected over the beaks, and furnished with a long curved muscular process beneath each. Pallial sinns deep. Siphons long. The ligament is strong and elastic, external, and strengthened with an accessory membrane formed by the coriaceous end of the mantle, which issues between the anterior ends of the valves and covers it, and is, moreover, armed with siliceous granules. These shells indeed exhibit the perfection of adaptation for boring mechanically into rocks, wood, or other substances, and their burrows are made by constantly rotating their valves by means of their sucker-like foot. The animals are vividly phosphorescent, and excellent eating.

#### Sub-family PHOLADINÆ.

PHOLAS, *Linnaeus*.

Shell equivalve, with accessory dorsal valves.

- \*     ,,     OBTECTA, Sow.
- \*     ,,     INCEL, Sow.
- \*     ,,     (*Dactylina*) ORIENTALIS, Gmel.

JOUANNETIA, *Des Moulins*.

Shell globose, inequivalve. The front gape closed by a callous plate. Right valve produced posteriorly, the left overlapping the dorsal valve. Dorsal plate single. Umbonal processes none.

- \*     ,,     GLOBOSA, Sow.
- \*     ,,     CUMINGII, Sow.

These shells abound in calcareous rocks on the coast, and having excavated their burrows, would seem to become fixtures therein, so tightly do they fit into and fill the cavity which contains them.

MARTESIA, *Leach*.

Shell equivalve, the front gape closed by a callous plate. Valves regularly divided in front by a furrow, extending from the beaks to the base. Lives in fresh, brackish, or salt water.

„ FLUMINALIS, W. Blanford.

Irrawaddy Delta.

Sub-family TEREDININÆ.

TEREDO, *Linnaeus*.

The ‘*Teredo*’ or ship-worm differs from the generality of bivalves by becoming fixed at a very early period of its existence, after which it constructs a shelly tube in the timber whereon it has fixed. The *Teredos* are, however, amiable and social creatures, never interfering with one another’s paths, though often crowded together as closely as it is possible for them to be packed, whereas some burrowing shells, as *Lithodomus*, cut clean through any opposing substance, even though the same should be the body of an unoffending brother bivalve.

\* „ (*Calobates*) THORACITES, Gould.

and several undetermined species.

### Class PTEROPODA.

Of the Pteropods of the Burmese seas we know nothing. These beautiful oceanic creatures are crepuscular in their habits, sinking far from the surface during the day, and rising again towards evening; hence they are only to be captured by a net of muslin or bunting suspended during light winds from a sailing ship during the night. Their tiny and exquisitely beautiful shells are ceaselessly ‘raining’ down into the abyssal depths of the ocean (as the animals die), and are filling up its hollows with an impalpable mud, somewhat analogous to the English chalk, of which it is no poetic figment to say “The dust we tread upon was once alive.”

### Order SCAPHOPODA.

Head rudimentary. Mouth surrounded by filiform tentacles. Eyes none. Heart none. Branchiæ none. Sexes distinct.

Shell tubular, curved, perforate at each end.

### Family Dentaliidæ.

\*DENTALIUM OCTOGONUM, Lam.

\* „ LONGITRORSUM, Reeve.

\* „ GADUS, Mont.

Identical, *vide* Hanley, with British examples (sed?).

### Class GASTEROPODA.

Locomotion effected by the ventral disk or foot. A distinct head in nearly all, with one or two pair of tentacles. A heart, liver, and convoluted intestine present, and the mouth furnished with a radula or ‘lingual ribbon,’ as it is called, armed with teeth.

### Sub-class OPISTHOBRANCHIATA.

Gills exposed or slightly covered by a fold of the mantle, situated behind the heart, and never lodged in a distinct cervical cavity. Sexes united in the same individual. Larva shell-bearing, and furnished with deciduous cephalic fins (H. and A. Adams).

## Order TECTIBRANCHIATA.

Gill forming a tuft or plume towards the hind part of the body, under a fold of the mantle. Foot elongate, formed for walking. Marine.

"Observed (writes Adams) under favourable circumstances in their native haunts, the *Tectibranchiate* mollusks are by no means unattractive or sluggish in their habits, but contribute, by their changing forms and lively colours, to lend animation to the weedy shores and coral reefs among which they take up their abode. The *Bulla* there, no longer a shapeless mass of blubber, expands its fleshy foot lobes, and floats leisurely through the water; and crawling on the rocks above the ripple of the sea the green amphibious *Smaragdinella* may be observed probing the surface with its plastic head disk. Gliding along the surface of the slimy mud, the *Pleurobranchus* may be seen, its back splendid with varied colours, or the *Operculatum*, more sedentary in its habits, fastened by its thick, deep orange foot, studded with pearl-like tubercles, to the bottom of the shallow pools, while gliding briskly over the branches of the corals, the *Aplysæ*, or sea hares, may be noticed extending their necks, and busily exploring everything within their reach."

## Family Actæonidæ.

- \*BUCCINULUS SOLIDULUS, L.  
 .. COCCINATUS, Reeve. Andamans.

## Family Aplustridæ.

- \*HYDATINA VEXILLUM, Chem.

## Family Bullidæ.

- \*BULLA AMPULLA, L.  
 \*HAMINEA TENERA, W. Bl.  
 \* .. CYMBULUM, Quoy et Gaimard.  
 \*ATYS NAUCCUM, L.  
 .. CYLINDRICA.  
*R. elongata*, A. Adams.  
*Bulla solida*, Brug.

## Family Aplysiidæ.

APLYSIA, sp.

An undetermined species is not rare on the Arakan coast. When molested, it pours forth a quantity of deep violet fluid.

## Order NUDIBRANCHIATA.

Gills exposed or contractile into cavities on the surface of the mantle. Adult animal shell-less. "While the numerous tribes of mollusks furnished with testaceous coverings offer us objects of contemplation remarkable alike for their extreme beauty and the durability of their calcareous envelopes, the scarcely less extensive and certainly far less known families of the Naked-gilled Gastropods exhibit an astonishing variety of form, extreme delicacy of organization, and great diversity of colour to captivate the eye, and occupy the attention of those who wander by the shore or explore the depths of the ocean. Clinging to the stems of floating sea-weeds, many, like the *Anthobranchs*, will be seen extending their flower-like gills of surpassing elegance, exploring with their foliated tentacles or complex mantle filaments the plants around them, the brilliant hues of their striped or spotted bodies glancing through the water. Some will be observed with bodies so fragile and pellucid that you may see the colour of their blood, and count the pulsations of their hearts; some will be seen to have their gills disposed in rows of papillary tubercles on the sides of their bodies, like the *Æolids*, or tree-like and branching like the *Tritomas*. The foreheads of some will be smooth and simple, while those of others will be found adorned with various

singular appendages. In others again all processes will disappear, all branchial arrangements vanish, and we shall meet with forms almost as simple in their structure as the Nemertoid types among annelids. In their embryonic state these lovely fragile mollusks are supplied with little clear spiral shells, and swim like Pteropoda freely through the water; being furnished at this epoch of their lives with two head-fins and a large frontal veil. As they grow, however, the shell falls off, and the veil becomes modified, but is usually persistent in the adults." Adams (Gen. Moll. vol. ii. p. 47). The *Nudibranchs* of Burma are as yet wholly unknown.

In the Proceedings of the Zoological Society of London, however, for 1877 (p. 196), some 460 species of Anthobranchiate mollusks are enumerated and described by M. Phineas S. Abraham, of which ninety-five are recorded from the Red Sea or the coasts of India, and many of which undoubtedly range to Burma. Of the whole of these 460 species, only a single species, *Doridopsis limbata*, Cuv., is reported as inhabiting both the Mediterranean and Red Sea, and *Doris verrucosa*, Cuv., the Mediterranean Sea and Mauritius.

### Sub-class *PROSOBRANCHIATA*.

Gills plumose or pectinate, placed in a cavity above the neck or under the mantle on the left side. Heart behind the gills. Sexes distinct. The adult and larva both provided with shells, the latter also furnished with deciduous ciliated fins springing from the sides of the head.

#### Order PECTINIBRANCHIATA.

Gills comb-like on the left side of the mantle over the back of the neck.

#### Sub-order *PROBOSCIDIFERA*.

The predaceous gastropods are armed with a retractile proboscis, by means of which they firmly hold and perforate the shells of bivalves in order to feed on the animal within. Their instinct would, however, seem occasionally to be at fault, as spines of a sea-urchin have been found so drilled, apparently by mistake on the part of some hungry gastropod.

### Family **Muricidæ**.

#### MURICINÆ.

##### MUREX, *Linnaeus*.

In this genus a 'varix,' or thickening of the lip, is secreted at each third of the periphery of a whorl annually.

„	APUNCO-SPINOSUS, Beek.	Andamans.
„	NIGRISPINOSUS, Reeve.	Andamans.
*	„ UNDATED, Pfr.	
*	„ CONTRACTUS, Reeve.	
*	„ MARTINIANUS, Pfr.	
*	„ PINNATUS, Swain.	
*	„ TERNISPIRA, Lam.	

##### Sub-genus CHICOREUS.

*	„ CAPUCINUS, Lam.	
*	„ ADUSTUS, Lam.	
*	„ MICROPHYLLUS, Reeve.	

##### Sub-genus OCINEBRA.

„	BREVICTILUS, Sow.	Andamans.
„	<i>M. tetragonus</i> , Reeve (non Brod.).	
„	GIBBA, Pease.	Andamans. Ceylon.

Sub-genus *MURICIDÆ*.

..	CIRROSUS, Hinde.	Andamans.
..	RUSTICUS, Reeve.	Andamans.
..	BARCLAYANUS, H. Adams.	Andamans.

## FUSINE.

*Fusus, Klein.*

The typical fusi are (as their name implies) elongate shells, with the mouth produced into a straight canal.

*	..	MULTISQUAMOSUS, Reeve.	
*	..	THEOBALDI, Hanley (MS.).	
*	..	n.s. near LIGNARIUS, Lam.).	
	..	AENORMIS, E. A. Smith.	Andamans.
*	PYRULA	FUGILINA, Born.	
*	..	TERNATANA, Lam.	
*	..	RAFA, Gmel. (non L.).	
*	..	BULBOSA, Dillwyn.	
*	..	VIOLACEA, Kien.	
*	..	NERITOIDEA, Chem.	
*	CANTHARUS	NUDOSUS, L.	

*Family* **Pleurotimidæ.**

These shells differ from the *Fusi* by having a 'sinus' or slit in the outer lip near the suture, which is in correlation to a slit on the mantle of the animal. Operculum ovate, nucleus apical.

*	PLEUROTOMA	FULMINATUS, Klein.	
*	..	TUBERCULATUS, Gray.	
*	..	CRENULARIS, Lam.	
*	..	CATENA, Reeve.	
*	..	GRIFFITHII, Gray.	
*	..	CLARUS, Reeve.	
*	..	ABBREVIATA, Reeve.	Andamans.
*	..	TIGRINA, Lam.	Andamans.
	DRILLIA	LUCIDA, G. and H. Nevill.	Andamans.
	..	ACUMINATA, Migh.	Andamans.
	..	VARIABILIS, E. A. Smith.	Andamans.
	..	WILMERI, E. A. Smith.	Andamans.
	MANGELIA	FULVOCINCTA, G. and H. Nevill.	Andamans.
	..	FAIRBANKI, G. and H. Nevill.	Andamans.
	CLATHURELLA	RUGOSA, Migh.	Arakan Coast.
	..	REEVEANA, Desh.	Andamans.
	..	<i>C. tumida</i> , Pease.	
	..	APICULATA, Montr.	Andamans.
	..	var. MINOR, G. and H. Nevill.	
	..	MALLETI, Recl.	Andamans.
	..	NIGROCINCTA, Montr.	Andamans.
	..	SINGULARIS, G. and H. Nevill.	Andamans.
	..	MASONI, G. and H. Nevill.	Andamans.
	..	ARMSTRONGI, G. and H. Nev.	Andamans.
	CYTHERA	DUBIOSA, G. and H. Nevill.	Andamans.

*Family* **Tritoniidæ.**

The 'Tritons' resemble *Murex*, but the teeth, according to Adams, are in seven rows or thereabouts, whereas in *Murex* there are three rows only.



\*TRITONIUM RETUSUM, Lam.

*	LAMPAS, L.	
"	STRANGEL, Adams.	Andamans.
"	ORIENTALE, G. and H. Nevill.	Andamans.

STRANGE, Adams.

, ORIENTALE, G. and H. Nevill. Andamans.

*Ranella* differs from *Marex* by each whorl being marked by two instead of three raised *varices*.

RANELLA PUSILLA, Brod. Andamans.

*Triton laciniatum*, Migh.

*R. rosea*, Reeve.

*Bursa concinna*, Dkr.

\* „ GRANIFLRA, Lam.

\* ,, TUBERCULATA, Brod.

\* „ ALBOVARICOSA, Reeve.

*Family* Buccinidæ.

Teeth in three series. Front of the shell usually notched. Siphon carried recurved.

NASSINE.

The aperture of this group of shells is either truncate or with a short recurved canal, and the inner lip is usually callous and spreading over the last whorl.

\*EBURNA CANALICULATA, Scham.

The *Ebarnas* are smooth solid shells spotted with dark red.

\*CANIDA BOCOURTI, Brot. Rangoon River.

\*BULLA BLANGIER, Kien.

PHOS, *Montfort.*

The foot of *Phos* terminates in a tapering filament.

,, SCUTICOSUM, L. Andamans.

,, ROSEATUM, Hinds. Andamans.

,, TEXTUM, Gmel. Andamans.

*B. Blainvilliei*, Desh.

*B. cancellatum*, Quoy et Gaim.

*P. cyanostoma*, Sow. (not Adams).

„ BLAINVILLE. Andamans.

NASSA, *Martini*.

The foot of *Nassa* is large and bifurcate behind. The shell has a smooth callous base, with a short anterior canal. The animals are active, and crawl vivaciously over mud and sand in search of bivalve shells, which they pierce with their proboscis (the radula acting as a drill), and extract the animal through the aperture, which is usually made near the beaks, and rarely if ever near the margin.

\*,, STOLATA, Wood.

\* „ PULLUS, L.

\*,, CORONATA, Brug.

\* BROWN, Phil.

\* " LURIDA, Gould. Andamans.

*N. dispar*, A. Adams.

,, MARRATHI, Smith. Andamans.

,, PERSICA, v. Mart. Andamans.

„ BIFARIA, Baird. Andamans.

\* ,, CANALICULATA, Lam.

MONILE, Kien. Andamans.

„ LIVIDA. Andamans.

Sub-genus *NIOBIA*, *H.* and *A. Adams*.

*	„	<i>RETICOSA</i> , A. Adams.	
*	„	<i>CUMINGII</i> , Reeve.	
*	„	<i>MARGINULATA</i> , Lam.	
*	„	<i>ALBESCENTS</i> , Reeve.	Andamans.
	„	<i>MARGARITIFERA</i> , Dunker.	Andamans.
	„	<i>N. costellifera</i> , A. Adams.	
	„	<i>STIGMARIA</i> , A. Adams.	Andamans.
	„	<i>GEMMULIFERA</i> , A. Adams.	Andamans.

Sub-genus *ARCUARIA*, *Link*.

*	„	<i>GLOBOSA</i> , Quoy and Gaimard.	Andamans.
	„	<i>GRANIFERA</i> , Kien.	Andamans.
	„	<i>BIMACTIOSA</i> , A. Adams.	Andamans.
	„	<i>CALLOSPIRA</i> , A. Adams.	Andamans.

Sub-genus *ALECTRION*, *Montfort*.

	„	<i>ELEGANS</i> , Kien.	Andamans.
--	---	------------------------	-----------

Sub-genus *HEBRA*, *H.* and *A. Adams*.

	„	<i>ECHINATA</i> , A. Adams.	Andamans.
	„	<i>DORRIDA</i> , Dunker.	Andamans.
	„	<i>N. curta</i> , Gould.	
*	„	<i>MURICATA</i> , Reeve.	

Sub-genus *ZEUXIS*, *H.* and *A. Adams*.

*	„	<i>MITRALIS</i> , Reeve.	
*	„	<i>BADIA</i> , A. Adams.	
*	„	<i>CONCINNA</i> , Powis.	
	„	<i>PLANICOSTATA</i> , A. Adams.	
	„	<i>CRENUCLATA</i> , Brug.	Andamans.
*	„	<i>TENIA</i> , Gmel.	Andamans.
	„	<i>N. olivacea</i> , Brug.	

Sub-genus *TELASCO*, *H.* and *A. Adams*.

*	„	<i>PUNCTATA</i> , A. Adams.	
---	---	-----------------------------	--

Sub-genus *HIMA*, *Leach*.

	„	<i>PAUPEREA</i> , Gould.	
	„	<i>SISTROIDEA</i> , G. and H. Nevill.	Andamans.

Sub-genus *TRITIA*, *Risso*.

	„	<i>COSTELLIFERA</i> , A. Adams.	Andamans.
--	---	---------------------------------	-----------

## PURPURINE.

*PURPURA*, *Aldrovandus*.

Operculum oblong. Nucleus elongate, forming the outer edge.

This genus is so named from many of its species yielding the celebrated 'Tyrian purple,' one of the costliest articles of luxury known to the ancients. The dye is contained in a small vessel, and was obtained by pounding the shells whole in basins cut out of the solid rock on the shore, and the purple colour only became developed by exposing the articles dipped in the juices of the animal to a bright sun.

"From one of the *Buccini* a purple colour has been derived, long esteemed of great value. According to Pliny, the artists began by removing the vein containing it, and adding to one hundred pounds of this substance twenty ounces of salt, the whole being allowed to macerate for exactly three days. It was then boiled in a leaden caldron until greatly reduced. A moderate heat was then kept up by means of a long stove, after which the flesh, which remained attached to the veins, was skimmed off; and the tincture being completely liquefied on the tenth day, and

afterwards strained, the wool was plunged into it. They continued to keep it warm until the desired hue had been obtained. A lively red was less valued than a blackish one.

"The wool was left to steep for five hours, for after being corded it was re-plunged into the bath, until it had imbibed as much of the liquid as possible. The buccinum was not employed by itself, because the dye it produced would not hold, or rather, perhaps, because it did not preserve the lively red; but by mixing it with the purpura, it gave to the too dark tint of the latter the solidity and brilliancy of the scarlet, which was greatly valued. 'By this mixture,' says Pliny, 'that superb colour is obtained which is named amethyst.'"

This colour would seem to have been held by the Romans especially appropriate for the nuptial couch of wealthy couples, as red or crimson is at the present day in Bengal by all classes of Hindoos.<sup>1</sup> Catullus, in his epithalamium to Julia and Manlius, says—

"Aspice, intus ut accubans  
Vir tuus *Tyrio in toro*  
Totus immineat tibi,"

and still more significant is the allusion of Claudian in his Pescennine verses on the occasion of the nuptials of Maria and Honorius—

"Anplexu caleat purpura regio,  
Et vestes *Tyrio sanguine fulgidas*  
Alter virginis nobilitet error."

*PURPURA GRADATA, Phil.	
" MUSOVA.	Andamans.
* " CARINIFERA, Lam.	
* " SACCELLUM, Reeve.	
* " TUBARELLA, Lam.	
* " UNDATA, Lam.	
* " REDOLPHI, Chem.	
* " BIFFO, Lam.	
* THALESIA) <i>H. and A. Adams</i> , BITUBERCULARIS, Lam.	Andamans.
" PICA, Kien.	
* " HIPPOCASTANUM, Lam.	
* " ECHINATA, Reeve.	
*TROCHIA) <i>Swinson</i> , SPIRALIS, Gray.	
*LOPAS SCITULA, Reeve.	
* " SERTUM, Lam. (or a closely allied sp.)	
*RICINULA HORRIDA, Lam.	
" ARACHNOIDES, Lam.	
* " TUBERCULATA, Klein.	
" ANAXARES, Duclou.	
* " AFFINIS, Pease.	
" MUSIVA, Reeve.	
SISTIUM ENDATUM, Chem.	
var. <i>Indica</i> , Nevill.	Andamans.
" MARGARITICOLA, Brug.	Andamans.

#### RAPANINÆ.

Operculum ovate, blunt, the nucleus elongate, forming the outer edge, as in *Purpura*.

<sup>1</sup> Quantum differt sententia Bengalensis in hac re ab immodestia legis Mosis! Deut. xvii. 15.

CUMA KIOSQUIFORMIS, Duches.  
 RAPA PAPIRACEA, Lam.

Andamans.

The habitat of this shell, which has been captured alive by the Rev. C. Parish, is very curious. It burrows in the substance of a species of sponge, which crusts the rocks to a thickness of several inches; forming a thick leathery coating, which has to be torn in pieces to extract the living shells. Dead shells can be picked up in plenty, but the living shell is only to be found buried in the substance of the sponge, at the Andamans at least, so far as Mr. Parish could judge. The operculum is ovate, pointed at one end, and corneous.

MAGILUS ANTIQUORUM, Mont.

This curious little shell lives imbedded in living coral, to keep pace with the growth of which, and prevent itself being overlapped and smothered, the lip of the shell is produced into a long tube *parri passu* with the growth of the surrounding mass; thereby maintaining access to the free water of the sea. On removal from the inclosing coral, the shell of three or four whorls, the size of a 'periwinkle,' is seen glued, as it were, to the end of an enormously disproportionate tube of a couple of feet or more in length, and solidified throughout, save its mouth, which is occupied by the animal.

### Family Olividae.

Teeth in three series. The siphon recurved. Foot large and usually reflexed over the sides of the shell. Operculum small or wanting.

#### HARPINÆ.

Operculum none. Shell ventricose, ribbed. These animals are handsomely coloured and variegated, and have the singular power of spontaneously detaching a portion of the foot when molested, resembling in this respect *Haliotidea* and *Gena*. At Mauritius they are caught with lines baited with flesh (Adams).

- \*HARPA NOBILIS, Lam.
- \* „ CONOIDALIS, Lam.
- \* „ MINOR, Lam.
- \*OLIVA GIBBOSA, Born.
- \* „ TRICOLOR, Lam.
- \* „ EPISCOPALIS, Lam.
- \* „ ISPIDULA, L.
- \* „ TEXTILINA, Lam.
- \* „ PONDEROSA, Reeve.
- \* „ IRRISANS, Lam.
- \* „ CARNEOLA, Lam.
- \* „ MAURA, Reeve.
- \* „ LEPIDA, Gould.
- \* „ GUTTATA (var. LEUCOPHŒA).
- \*ANCILLARIA CANDIDA, Lam.

### Family Fasciolaridæ.

Teeth in three series. Siphon straight. Operculum acutely ovate, with apical nucleus. Shell fusiform, with plaits on the fore part of the columella.

- \*FASCIOLARIA TRAPEZIUM, L.
- \* „ FILAMENTOSA, Lam.
- LATIRUS DECORATUS, A. Adams. Andamans.
- „ FASTIGIUM, Reeve. Andamans.
- „ INCARNATUS, Desh. Andamans.

*Family Vasisidæ.*

- \*MAZZA CORNIGERA, Lam.  
 \* „ SMARAGDULUS, L.  
 \* „ RAPA, Lam. (non Reeve).  
 \* „ INCARNATA, Reeve.

*Family Volutidæ.*

Teeth in a single series. Mantle often greatly developed and covering the shell. Siphon short, recurved, with auricles at its base. Foot large. Operculum none. Tentacles remote, united by a veil. Columella plaited. Apex of shell mammillated.

MELO INDICA, Gmel.

*Family Mitridæ.*

Tentacles approximate at their base. Foot small and triangular. Operculum none or rudimentary. Columella plaited. Apex acute.

## MITRINÆ.

Foot truncated in front.

MITRA, *Lamarck*.

When irritated some species of *Mitra* emit a purple fluid, having a nauseous odour.

- \* „ AURANTIA, Lam.  
 \* „ CEREBRILIRATA, Reeve.  
 \* „ MELISA, Reeve. Andamans.  
 \* „ MARLE, H. Adams. Andamans.  
 \* „ PERMISTINA, Reeve.  
 \* „ WALDEMARI, Kien.  
 \* „ SCUTELLATA, Chem.  
 \* „ CRINULATA, Chem.  
 \* „ Plicata, Lam. Andamans.  
 \* „ GUTTATA (?) Reeve.  
 \* „ NUBILOSA?  
 \* „ LILINUS, Lam. (Mediterranean species!).

An allied species is perhaps meant, as Mr. G. Nevill is probably correct in asserting that not one single species is common to the Mediterranean and the coast of Arakan.

- \* „ STIGMATARIA.  
 \* „ FILOSA.  
 \*NERULARIA ADUSTA, Lam.  
 CANCELLA ANNULATA, Reeve. Andamans.  
 „ PHILIPPINARUM, A. Adams. Andamans.  
 CHRYSAME TABANULA, Lam. Andamans.  
 „ CUCUMERINA, Lam. Andamans.  
 \*TURRICULA MELONGENA, Lam. Andamans.  
 \* „ GRUNERI, Reeve. Andamans.  
 COSTELLARIA CRUENTATA, Chem. Andamans.  
 „ EXASPERATA, Chem. Andamans.  
 „ DESHAYESII, Reeve. Andamans.  
 „ SEMIFASCIATA, Lam. Andamans.  
 CALLITHEA OBEFUSCUS, Reeve. Andamans.  
 var. *Andamana*, G. and H. Nevill.  
 „ ACUPICTA, Reeve. Andamans.  
 CYLINDRA UNDULOSA, Reeve. Andamans.  
 \* „ DACTYLUS, L.  
 \* „ GLANS, Reeve.

*Sub-family COLUMBELLINÆ.*

Foot anteriorly produced. Shell usually invested with an epidermis. Inner lip toothed, outer lip gibbous. The dentition resembles that of the *Muricida*. (Adams.)

*COLUMELLA	VIRSCOLOR, Sow.	
* ..	LINEOLATA, Kiehl.	
* ..	FLAVA, Brug.	
* ..	OVULATA, Sow.	
* ..	MENDICARIA, L.	
* ..	ZONALIS, Lam.	
* ..	PUMILA (?).	
* ..	DUCLOSIANA, Reeve.	
* ..	ARAKANA, Hanley (MS.).	
..	NIGRICOSTATA, E. A. Smith.	Andamans.
..	FUELLA, Sow.	Andamans.
..	PARDALINA, Lam.	Andamans.
ZAFRA	TENTACULATA, G. and H. Nevill.	Cape Negrais.
ENGINA	ASTRICTA, Reeve.	Andamans.

*Family Marginellidæ.*

Teeth similar to those of *Voluta*. Tentacles close together at the base. Mantle with expanded side lobes, covering the shell. Siphon elongate. Foot large, truncate before, elongated behind. Operculum none. Shell porcellaneous, polished; columella plaited. Outer lip thickened.

*MARGINELLA	ANGUSTA, Sow.	
* ..	QUINQUEPLICATA, Lam.	

*Family Doliidæ.*

Teeth in seven rows. Siphon recurved. Foot small. Operculum none. Shell thin, ventricose, transversely ribbed; aperture with an oblique notch in front.

*DOLIUM	MACULATUM, Lam.	
* ..	CUMMINGII, Hanley.	
RINGICULA	ACUTA, Phil.	Arakan Coast.
var.	<i>minuta</i> , H. Adams.	
..	APICATA, Nevill.	Andamans.

*Family Ficulidæ.*

Teeth in seven rows. Mantle covering the shell. Siphon long and straight. Operculum none.

The animals of this group crawl very rapidly, bearing their light shells easily and with their neck stretched out, their siphon exerted and foot expanded, present a remarkable object. They are generally flesh-coloured animals, marked with crimson and pink, their eyes large and black, and their long flat heads and neck usually white. (Adams.)

*FICULA	FICUS, L.	
* ..	PAPYRACEA, Lam.	

*Family Naticidæ.*

Teeth in seven rows. Animal bulky. Tentacles distant, united by a veil. Eyes absent or minute, and beneath the veil. Foot very large, with a fold in front reflexed over the head. Operculigerous lobe very ample. Operculum paucispiral. The size of the operculum seems to be in inverse ratio to the size of the mouth, being horny and rudimentary in *Catinus*, but ample and calcareous in *Natica*. The eggs of the *Naticidæ* are arranged in broad subspiral bands or fillets, slightly attached and resting on the sand.

The *Naticæ* frequent sandy ground, along which they creep quickly, or in which they burrow in pursuit of bivalves, which constitute their food, whose shells they drill with their tongue, and then extract the contents by means of their long retractile proboscis.

- \**NATICA GLOBOSA*, Phil.
- \* .. *PELLI-FRIGIDA*, Kust.
- \* .. *CHUMITZII*, Reeve.
- \* .. *MAMMILLATA*, Lam.
- \* .. *LINFATA*, Lam.
- \* .. *ARACHNOIDEA*, Gmel.
- \* .. *MILANOSTOMA*, Gmel.
- \* .. *ANTONI*, Phil.
- \* .. *ZANZEBARICA*, Reeve.
- \* .. *ZONARIA*, Lam.
- \* .. *ELENTATA*, Phil.
- \* .. *SIMILE* (?), Reeve.
- \* .. *GALACTITES*, Phil.

*MAMMA, Klein.*

Operculum horny. Shell solid, smooth, with inner lip oblique, thickened. Columella spirally twisted. Apex more or less dilated and convex. When the animal crawls, the hind lobe of the foot nearly covers the shell.

- |                              |           |
|------------------------------|-----------|
| <i>MAMMA ALBULA</i> , Rumph. | Andamans. |
| .. <i>MAMMILLA</i> , L.      | Andamans. |

*CATINUS, Klein.*

Operculigerous lobe very large, almost concealing the shell. Operculum very small and rudimentary.

The *Catini* are sluggish and very timid, crawling on mud flats, and exploring the ground with the produced fore-lobe of the foot.

- \**CATINUS DELESSERTII*, Recluz.
- (*fuscus*, Morel.)
- \* .. *PLANUS*, Reeve.

*Family Cassididæ.*

Teeth, many rows of lancet-shaped ones, and one denticulated row in the centre. Siphon recurved. Foot large, dilated. Operculum annular, nucleus in the middle of the straight inner edge. Shell ventricose, aperture with a recurved canal, outer lip thickened, inner lip wrinkled or granular. The *Cassidæ* or 'Helmets' are active and voracious, preying on bivalves. The shells of the larger species are used in the manufacture of 'cameos.'

- \**SEMICASSIS AREOLA*, L.
- \* .. *GLAUCA*, L.
- \* .. *BIARMATA*, Dillwyn.
- .. *S. torquata*, Reeve.
- \* .. *ERINACEUS*, Brug.
- \**CASSIDEA VIBEX*, L.

*Family Scalariidæ.*

Teeth in transverse rows, with no median series. Mantle with a rudimentary siphonal fold. Foot obtusely triangular, grooved below, and furnished in front with a fold. Operculum horny, paucispiral. Animal predaceous. Shells white, and remarkable for their elegant sculpture.

- \**SCALARIA TRILINEATA*, De Haan.
- \* .. (like a dwarf *COMMUNIS*).

*Family Terebridæ.*

Radula and teeth rudimentary or wanting. Tentacles small or wanting. Foot small. Operculum annular. Nucleus apical.

## TEREBRINÆ.

*Acus, Humphrey.*

Eyes on the tip of the tentacles.

\* „ *PLICATA*, L.

\* *HASTULA ANOMALA*, Hind.

*TEREBRA, Adanson.*

Eyes at the outer bases of the tentacles.

\* „ *STRAMINEA*, Reeve.

\* „ *SWAINSONI*, Reeve.

\* „ *MYRUS*, Hind.

\* „ *FORTUNEI*, Reeve.

„ *AFFINIS*, Gray.

Andamans.

„ *EXIGUA*, Desh.

Andamans.

*Family Pyramidellidæ.*

Radula unarmed, teeth none, or rudimentary. Tentacles broad, ear-shaped, connate at their base, and bearing the eyes immersed on their inner sides. A rudimentary siphonal fold. Foot produced anteriorly, truncated and with a fold in front. Operculum horny. Shell turritid, aperture entire, not produced. Columella plaited.

*PYRAMIDELLA, Lamarck.*

Shell turritid, many-whorled. Longitudinally ribbed.

\* „ *VARIIGATA*, Adams.

\* „ *AURIS-CATI*, Chem.

Andamans.

*OBELISCUS, Humphrey.*

Shell subulate; many-whorled, smooth. *Obeliscus* differs from *Eulimella* by having the columella plaited; from *Pyramidella* by wanting the longitudinal ribs; and from other members of the family by its plaited columella and subulate form.

\* „ *DILABIATUS*, Adams.

\* „ *TEREBELLUM*, Reeve.

\* „ *VENTRICOSUS*, Guer.

*Family Eulimidæ.*

Radula and teeth rudimentary. A rudimentary siphonal fold. Foot produced in front, with a bilobed fold above the front margin. Operculum horny, ovate, sub-spiral. Shell turritid, white, aperture entire in front. Columella simple.

*EULIMA ACUTIFRONS*, Nev.

Andamans.

„ *ACUFORMIS*, G. and H. Nevill.

Andamans.

*Family Cerithiopsidæ.*

Eyes placed centrally at the base of the subulate tentacles. Mouth armed with a retractile proboscis. Foot quadrate in front, furnished superiorly with a fold, grooved below for half its length, the groove ending in a perforation.

*CERITHIOPSIS PAGODULA*, A. Adams.

*Family Solariidæ.*

Tentacles folded, with the suture below. Operculum horny, spiral, ovate or circular. Shell depressed, trochiform, not pearly. Radula unarmed.



SOLARIUM, *Lamarck*.

Shell angulated at the periphery. Operculum flat, subspiral.

\* „ PERSPECTIVUM, L.

TORINIA, *Gray*.

Shell rounded at the periphery. Operculum elevated, subspiral.

„ PERSPECTIVUNCULUS, E. A. Smith. Andamans.

#### Sub-order TOXIFERA.

Animal provided with a distinct retractile proboscis, furnished with a fleshy tube having a bundle of subulate barbed teeth at the end, which act very efficaciously in boring through the shells of other molluses.

Adanson states that the tubular expansion of the veil serves as an oral sucker to attach the animal to its prey, the armed tube acting meanwhile as a powerful boring instrument.

#### Family Conidæ.

Operculum when present unguiform, with an apical nucleus. The Cones should be cautiously handled when alive, as they can bite severely.

- \*CONUS NICOBARICUS, Hwass.
- \* „ TEXTILE, L.
- \* „ PANNACEUS, Bonn.
- C. episcopus*, Reeve.
- \* „ ACHATINUS, Chem.
- \* „ MINIMUS, Brug.
- \* „ CONCOLOR, Sow.
- \* „ LINEATUS, Chem.
- \* „ RATTUS, Lam.
- \* „ CAPITATUS, L.
- \* „ GLANS, Brug.
- \* „ VERMICULATUS, Brug.
- \* „ ZONATUS, Hwass. Andamans.
- \* „ ANDAMANENSIS, E. A. Smith. Andamans.
- \* „ PRETIOSUS, G. and H. Nevill. Andamans.
- \* „ MASONI, G. and H. Nevill. Andamans.
- \*(SEEPHANOCONUS) LIVIDUS, Brug.
- \* „ DISTANS, Hwass.
- \* PUNCTICULUS) PULICARIUS, Hwass.
- (CORONAXIS) HEBREUS, L.
- „ CEYLONENSIS, Hwass. Andamans.
- „ PUSILLUS, Chem. Andamans.
- \* DENDROCONUS) BETULINUS, L.
- \* LITHOCONUS) EBURNEUS, Brug.
- \* „ FLAVIDUS, Lam.
- \*(LEPTOCONUS) CLERYI, Reeve.
- \* „ NOHLIS, L.
- „ MARCHIONATUS, Hinds.
- \*(CHELYCONUS) CATUS, Hwass.
- \* „ PARIUS, Reeve.
- \*(RHIZOCONUS) PUNCTATUS, Chem.
- „ MUSTELINUS, Hwass. Andamans.

#### Sub-order ROSTRIFERA.

A more or less elongate, contractile rostrum. Lingual ribbon often very long.

*Family Strombidæ.*

The Strombs are active and predaceous creatures, progressing in a jerky fashion, by successive leaps, which they effect by placing the narrow part of the foot under the shell, and then straightening it, so as to throw the shell suddenly forwards. Their eyes are well developed. The *Strombus gigas* of the West Indies sometimes produces pink pearls, and its shell is largely used in the manufacture of cameos and porcelain (Adams).

\*STROMBUS GIBBERULUS, L.

\*(MONODACTYLUS) LAMARCKII, Sow.

*M. Auris-diana*, Reeve.

\*(GALLINULA) CANARIUM, L.

\*,, COLUMBA, Lam. (Reeve. Andamans.

\*(STROMBIDEA) BULBULUS, Sow.

\*,, DENTATUS, L.

\*PTEROCERAS, *Sowerby*.

These shells are called 'spider claws' or 'scorpions,' from the curved, digitated, and channelled processes of the outer lip. In young shells the outer lip is simple, but the 'claws' appear with age, as open canals, which afterwards become closed and solid.

\*,, LAMBIS, L.

\*,, SCORPIO, L.

ROSTELLARIA, *Lamarck*.

Shell fusiform, spire elevated, and the mouth produced into a long beak. Outer lip digitated. Operculum small.

These shells are sometimes called 'spindle strombs,' from their shape.

\*,, FUSUS, L.

\*(RIMELLA) CANCELLATUS, Sow. Andamans.

## TEREBELLINÆ.

TEREBELLUM, *Klein*.

Tentacles none. Margin of shell acute, anteriorly truncate.

\*,, SUBULATUM, Chem.

One eye pedicle of this species is longer than the other, and can be advanced telescopically through the notch in front of the shell. It will then remain, with its shell vertically poised, on the watch till assured of security, when it commences to roll over and examine the ground with its rostrum (Adams).

*Family Cypræidæ.*

Teeth in seven series. Tentacles long, with the eyes on tuberosities on their external bases. Mantle furnished with a siphon, and large expanded side-lobes, which envelope the shell. Operculum none. Shell usually polished. Lips toothed or corrugated. In young shells the outer lip is sharp. The animal is shy and slow in its movements.

The 'cowries' are mostly inhabitants of warm seas, and for beauty and variety yield to no other family, their shells being lustrous and ornamental, and the animals, as seen gliding in their native element, often singularly beautiful.

\*CYPRÆA ASELLUS, L.

\*,, TABESCENS, Solander.

\*,, INTERRUPTA, Gray.

\*,, FELIXA, Gmel.

\*,, HIRUNDO, L.

\*CYPRÆA MELANOSTOMA, Leathes.

\* „ CARNIOLA, L.

\* „ ISABELLA, L.

Cowries with a flattened base, callous lip, and gibbous back.

\* ARICIA ANNULUS, L.

\* „ MONETA, L.

\* „ AFRICA, L.

\* „ MAURITIANA, L.

\* „ HISTRIO, Gmel.

\* „ CAPUT-SERPENTIS, L.

Andamans.

\* „ SCIRRA, Chem.

\* LUPONIA CAUTICA, L.

\* „ LYNA, L.

\* „ CRIBBRARIA, Lam.

\* „ GANGRINOSA, Gmel.

Andamans.

\* „ LAMARCKII, Gray.

\* „ TIGRIS, L.

\* „ VILLES, L.

\* „ PANTHERINA, Solander.

\* „ OCCELLATA, L.

Andamans.

\* „ HELIOLA, L.

Small cowries, with the back either transversely wrinkled, as in the little pink 'cowrie' of the European seas, or ornamented with pustules.

\* TRIVIA BECKII, Gaskoin.

\* „ ORYZA, Lam.

\* PISICULARIA STAPHYLEA, L.

\* „ NUCIUS, L.

\* (EPONA) GLORIOSA, L.

\* „ ANNULATA, Gray.

Andamans.

#### Family Amphiporasiidæ.

Teeth in seven rows. Shell pointed at both ends, polished, inner lip without teeth, outer lip inflexed. Operculum none.

CALPURNUS, *Montfort*.

Shell cowry-shaped, with a wart-like tubercle at either end.

\* „ VERRUCOSUS, L.

#### Family Cancellariidæ.

Radula and teeth none. Operculum none.

CANCELLARIA, *Lamarck*.

Shell ribbed and cancellated. Canal short. Columella with several strong oblique plaits.

\* „ SCALARINA, Sow. Thes. Con.

\* „ ELEGANS, Reeve.

\* „ CRISPATA (or CRENIFERA), Sow.

#### Family Cerithiidæ.

Teeth in seven rows. Rostrum broad and short. Tentacles distant, eyes on short pedicles adnate to the outer bases of the tentacles. A rudimentary siphonal fold. Operculum horny, spiral.

## CERITHIINÆ.

CERITHIUM, *Adanson*.

Shell turrited. Columella thickened. Some species emit a bright green fluid when molested.

- \* „ NODULOSUM, Lam.
- \* „ CERULESCENS, Sow.
- C. tuberculatum*, Kien non L.
- \* „ TRAILLI, Sow. Andamans.
- \* „ ARTICULATUM, Sow.
- ALVIOLES, Andamans.

VERTAGUS, *Klein*.

Shell with a strongly recurved beak.

- \* „ OBELISCUS, Brug.
- \* „ ASPER, L.
- \* „ KOCHI, Phil. Andamans.
- \* „ TURRITUS, Sow. Andamans.

COLINA, *H. and A. Adams*.

Shell elongate, swollen in the middle, the last whorl nearly smooth and somewhat pellucid. The outer lip dilated and reflexed.

- \* „ MACROSTOMA, Hinds.
- \* „ PUPIFORMIS, Sow.

## POTAMIDINÆ.

TRIFORIS, *Deshayes*.

Shell turrited, aperture produced anteriorly into a tubular canal, and sometimes a posterior canal also present. Operculum round, paucispiral.

- \* „ RUBER, Hinds.
- \* „ sp. (brown).
- \* „ SCULPTUS, Hinds. Andamans.

TYPHONOTONOS, *Klein*.

Shell turrited, whorls spinous. Columella twisted.

- \* „ FLUVIATILIS, Michaud.
- ALATUS, Phil.
- EURIPTERA, A. Adams.

TELESCOPICUM, *Chemnitz*.

Shell stout, pyramidal, smooth, last whorl angulated. Columella twisted.

- \* „ FUSCUM, Chem.

These marine marsh shells are collected for lime and the animal is also eaten.

CERITHIDEA, *Srairson*.

Shell turrited, apex decollated.

- \* „ OBTUSA, Lam.

The Cerithidea are brackish-water forms, and are amphibious, and can crawl out of the water and suspend themselves by glutinous threads to trees and bushes.

BROTIA, *H. Adams*.

Shell fusiform, whorls spinose. Operculum multispiral.

- PAGIDULA, Gould. Thoungyeen R. Martaban.

This is a fresh-water form, which was separated from the *Melaniidae* by Adams, from the character of its operculum, which approximates to that of the *Cerithiidae*.

*Family Melaniidæ.*

Teeth in seven rows, rostrum broad. Tentacles subulate, with the eyes on tuberosities on their outer bases. Siphonal fold rudimental. Operculum horny. Shell spiral, covered usually with a dark epidermis, and more or less eroded at the apex; outer lip simple.

MELANIINÆ.

*PALUDOMUS, Swainson.*

Operculum concentric. Apex usually decollated. These shells abound in hill-streams, but are also found in ponds and stagnant water.

„	ANDERSONIANA, G. Nev.	Ava. Bhamo.
„	BERMANICA, G. Nev.	Mandalay.
„	BLANFORDIANA, G. Nev.	Ava and Assam.
„	CINCTA, Gould.	Tenasserim Headwaters.
„	LABIOSA, B.	Tenasserim R.
„	REGULATA, B.	Pegu.

*MELANIA, Lamarek.*

Operculum paucispiral. Apex frequently eroded.

„	BACCATA, Gould.	Thoungyen R. Upper Tenasserim.
„	BALTEATA, Reeve.	Pegu.
„	BATANA, Gould.	Tenasserim R.
„	CORRUGATA, Lam.	Tavoy.
„	FLUCIOSA, Gould.	Newville, Tavoy.
„	HAINSIANA, Lecl.	Pegu.
„	HUMEROSA, Gould.	Manko, Tavoy.
„	JUGICOSUS, B.	Tenasserim R. and Irrawaddy R.
„	IRAVADICA, W. Bl.	Bhamo.
„	LINEATA, Gray.	Pegu.
„	PLUGENSIS, Anthony.	Pegu.
„	PREMORDICA, Tryon.	Thoungyen R. Upper Tenasserim.
„	RUELLI, Brot.	Pegu.
„	SCABRA, Müll.	Pegu.
„	THIARELLA, Lam.	Tavoy.
„	TUBERCULATA, Müll.	Pegu.
„	VARIABLES, B.	Pegu and Tenasserim.
	<i>M. Herculea</i> , Gould.	Tavoy.
	<i>M. gloriosa</i> , Ant.	Pegu hill streams.

*Family Littorinidæ.*

Teeth in seven rows. A rudimentary siphonal fold. Foot grooved below. Operculum horny, paucispiral. Shell turbate or depressed; never pearly.

*LITTORINA, Pussae.*

The *Littorinus* or Periwinkles are many of them very amphibious, living more out of the water than in it, though always within reach of the spray. Others again affect the zone between tidemarks, and a few are extensively collected for food.

*	„	SCABRA, L.	
		var. <i>angulifera</i> , Lam.	
*	„	UNDULATA, Phil.	Andamans.
*	„	MOLUCCANA, Phil.	
*	„	INTERMEDIA, Phil.	
*	„	MELANOSTOMA, Gray.	
*	„	VENTRICOSA, Phil.	Andamans.

\**RISSELLA LUTEA*, Quoy et Gaimard.

LITHOGLYPHUS, *Muhlfeldt*.

Tentacles subulate, eyes at their outer bases. Operculum ovate, paucispiral. Shell thick, smooth. Inner lip callous.

„ MARTABANENSIS, Theobald. Martaban.

A few specimens without the animals have been found in some places in the Martaban district, but have not been noticed elsewhere.

#### Family Planaxidæ.

PLANAXIS, *Lamarek*.

Teeth in seven rows. A produced siphon in front. This genus approaches *Littorina*, but is separated by the presence of a siphon.

\* „ SULCATA, Born.  
\* „ sp.

#### Family Rissoidæ.

Operculum horny, subspiral. Shell turrit, generally white, and aperture simple.

##### RISSOINÆ.

*RISSOINA	D'ORBIGNYI, Adams.	
* „	OBELISCUS, Recluz.	
* „	BICALLOSA, Schwartz.	
* „	CANCELLATA, Phil.	
„	FUNICULATA, Souverbie.	Andamans.
* „	WEINKAUFFIANA, G. Nevill.	Andamans.
* „	MINUTA, G. and H. Nevill.	Andamans.
„	EVANIDA, G. and H. Nevill.	Andamans.
* „	CLEATA, Adams.	

##### ASSIMINEINÆ.

ASSIMINEA, *Leach*.

Operculum horny, subspiral. Eyes placed superiorly towards the end of the tentacles. Inhabit salt, brackish, or fresh water near the coast.

„	FRANCESLE, Gray.	Pegu.
„	RUBELLA, W. Bl.	Pegu.
„	HUNGERFORDIANA, G. Nevill.	Mouth of the Rangoon R.
„	TEMPLEANA, G. Nevill.	Nicobars.

In addition to the above, the following species have been described, some of which may range to Burma:—

„	WOODMASONIANA, G. Nevill.	Mouth of the Ganges.
„	BEDDOMEANA, G. Nevill.	Mouth of the Ganges.
„	THEOBALDIANA, G. Nevill.	Mouth of the Ganges.
„	MICROSULPHA, G. Nevill.	Mouth of the Ganges.
IRAVADIA	ORNATA, W. Bl.	Bassein District.

#### Family Viviparidæ.

VIVIPARA, *Lamarek*.

Animal with a small lobe on each side of the neck. Shell turbate. Operculum horny, nucleus central.

„	BENGALENSIS, Lam.	Pegu and Tenasserim.
	<i>V. doliaris</i> , Gould.	Tavoy.
	<i>V. filosa</i> , Hanley.	Pegu.
	<i>V. digona</i> , W. Blanford.	Pegu.

VIVIPARA DISSIMILIS, Mull.	Pegu.
<i>V. heliceiformis</i> , Frauch.	Pegu.
<i>V. decussatula</i> , W. Blanford.	Bhamo.
<i>V. viridis</i> , Reeve.	
.. CHINENSIS, Gray.	Nautin. Monien. Hotha Yunnan).
<i>V. lecythis</i> , Benson.	
<i>V. ampulliformis</i> , Eyd. et Soul.	
.. PETROSA, Gould.	Tavoy.
.. SHANENSIS, Theob.	Upper Salween River.
<i>V. naticoides</i> , Theob. (pre-occupied.)	
MARGARYA MELANOIDES, G. Nev.	Lake Tali in Yunnan.
LARINA BURMANORUM, W. Blanford.	Bassein district and Rangoon River.

This shell occurs rarely at Port Cannug, *fide* Nevill.

## BYTHININÆ.

BYTHINIA, *Leach*.

Animal with a small lobe on one side of the neck. Operculum shelly, nucleus subcentral. Shell turbinate, covered with an epidermis. The female is oviparous and deposits her eggs in a band, on a spot which she cleans with her mouth for the purpose.

.. GONIOMPHALUS, Morl.	Mandalay.
<i>B. iravadica</i> , W. Bl. <i>fide</i> Nevill.	
.. MOULETIANA, G. Nevill.	Yaylaymaw.
.. NASSA, Theob.	Upper Salween R.
.. PULCHELLA, Hutton.	Pegu.
.. TURRITA, W. Bl.	Kyoutoung, Upper Burma and
<i>Fairbankia turrita</i> , W. Bl.	Irrawaddy Delta.

SUENGIHARA, *Benson*.

Shell compressed, whorls four, the last large, contracting towards the circular mouth. Operculum shelly, nucleus subcentral. Peristreme continuous, entire. Whorls often punctately sculptured.

.. MONILIFERA, B.	Mergui. Pegu.
.. PUNCTICULATA, Gould.	Tavoy.
.. HUNGERFORDIANA, G. Nevill.	Andamans.

The following species have been described from India, and may range to Burma.

.. WOODMASONIANA, G. Nevill.	Mouth of the Ganges.
.. BLANFORDIANA, G. Nev.	Chilla Lake and Ganges Delta.
.. MINIMA, Sow. (var. ?)	Madras and Kattiawar.

Family **Turritellidæ**.

Rudula minute, teeth in seven similar series. Foot very short. Operculum circular, horny, multispiral.

TURRITELLA, *Lamarck*.

Shell turritid, many-whorled, imperforate, spirally grooved, aperture round, lip simple, acute.

*	..	ATTENUATA, Reeve.	
*	..	COLUMNARIS, Reeve.	
*	..	DUPLICATA, L.	
	..	INFRACONTRACTA, E. A. Smith.	Andamans.

*Family Vermetidæ.*

Foot cylindrical, not serving for locomotion. Operculum horny, circular, multi-spiral (or wanting). Shell tubular, irregularly twisted, or only regular when young.

\**SPIROGLYTHUS CONTRARIUS*, Moreh.

This shell is by some classed as an *Annelid*.

*Family Onustidæ.*

Foot small, cylindrical, used for jumping, not walking. Operculum large, horny, subannular. Right half free, nucleus lateral, dextral. Muscular scar sinistral, semi-lunar. Shell trochiform, with foliaceous margin and fragments of stone and shell attached near the suture. The animal scrambles along over the rough ground like *Strombus*.

*ONUSTUS INDICUS*, Reeve.

*XENOPHORA SOLARIOIDES*, Reeve.

The 'carriers' inhabit deep water. Each species appears to have its own peculiar method of collecting the fragments of stones and shells with which it ornaments its shell, and each uses its own peculiar materials. The agglutinated fragments are so arranged as not to project downwards and impede the progress of the animal.

*Family Calyptræidæ.*

Radula winged in front. Teeth in seven series. Tentacles short, with the eyes on tuberosities on their outer bases. Foot flat, expanded. Operculum none. Shell patelliform, with an internal shelly appendage.

\**CRUCIBULUM EXTINGUORIUM*, Lam.

\* " *FASTIGIATUM*, Gould.

\**CREPIDULA UNGUIFORMIS*, Lam.

\* " *SCABRIS*, Reeve.

*Family Capulidæ.*

Radula and teeth, eyes and tentacles, as in *Calyptræidæ*. Foot folded on itself, anteriorly thin and strap-shaped, posteriorly thick, orbicular and concave. Operculum none. The egg-cases in this family are membranous, and form a tuft in front of the foot, under the neck.

\**CAPULUS AUSTRALIS* (?), Lam.

*AMALTHEA AUSTRALIS*, Lam.

Andamans.

*Family Ampullaridæ.*

Left gill rudimentary. Mantle cavity with a large pulmonary sack on each side.

"Although distinct gills exist, the respiratory cavity is very large and partly closed, so as to enable these animals to live a long time out of water; in fact they appear to be truly amphibious, and to be enabled to survive a long drought, and have been known to revive after having been kept several years out of water" (Adams).

*AMPELLARIA APERTA*, Phil.

Pegu.

*A. saxeæ*, Reeve.

" *CONICA*, Gray.

*A. paludinosides*, Phil.

" *MAURA*, Reeve.

" *THEOBALDI*, Hanley.

Martaban and Shan states.



## LAND SHELLS.

The following observations on the land shells of Burma, their relationship and distribution, are from the pen of Mr. W. T. Blanford, and are so pertinent that I make no apology for extracting them verbatim from the B. B. Gazetteer, for which work they were written:—

“Taking the land shells first, it should be recollected that they belong to two different classes of Mollusca, but to two classes very much more closely allied to each other than to any of the other classes into which the Mollusca are divided. These classes are: (1st) The operculated land shells, which are frequently arranged apart from the ordinary univalve shells of the seas or rivers, such as whelks, periwinkles, and *Paludinide*, on account of having a breathing chamber not furnished with certain appendages known as gills; and (2nd) the *Pulmonata*, or true snails, without opercula. By those naturalists who attach great importance to the modifications of the breathing organ, the operculated land shells are sometimes classed as a peculiar order or sub-order called *Neurobranchiata*, and sometimes united with the true *Pulmonata*. The latter course is certainly a mistake, for the two groups differ in almost every detail of their organization, and even the form of the breathing chamber is quite distinct; and as the only difference of any importance between the so-called *Neurobranchiata* and the ordinary *Gasteropoda* or *Prosobranchiata* consists in the adaptation of the breathing sac in accordance with the medium in which each form lives, (as there is in some families, as *Littorinide* and *Rissoide*, a gradation between pure air breathers and pure water breathers, and as an instance is even known in the estuarine genus *Cerithidea* inhabiting brackish creeks and salt swamps of two closely allied species, one possessed of gills and the other quite destitute of them,) it is plain that the distinction is adaptative and of no structural importance as evidence of relation.

Both of the two groups of land shells, the operculated and the non-operculated, or the air-breathing *Prosobranchiate Gasteropoda* and the *Pulmonata*, are represented by numerous species in Burma. The former, indeed, are very much more common, and represented by many more forms in Burma than in the Peninsula of India generally, with the exception, perhaps, of the hills along the Malabar coast. Their forms, too, are, on the whole, more remarkable and varied, and some of them are exquisitely coloured or sculptured. Many are minute, but the largest are of considerable size, some forms of *Cyclophorus* being upwards of two and a half inches in diameter. The non-operculate shells also vary in size, but minute forms are rather less numerous.

A list of the known Burmese land shells is given in the following pages. Figures of almost all of these will be found in the ‘Conchologia Indica’ of Hanley and Theobald, but the descriptions are scattered through many different works, and can only be found united in Pfeiffer’s ‘Monographia Heliceorum’ and ‘Monographia Pneumonoporum,’ neither of which is illustrated. The former contains the non-operculate forms, the latter those possessed of opercula.

The following are the genera occurring. Those in the first family noticed—the *Rissoide*—are of minor importance. The *Rissoide* are principally small marine estuarine and freshwater shells, and it is uncertain whether *Aemella* is justly referred to them. *Truncatella* is scarcely a land shell, being confined to the sea-shore. *Aemella hyalina* is a very minute hyaline, smooth, conoidal form of doubtful affinities, and only found hitherto on limestone hills near Maulmain. The family *Pomatiaside* contains only the genus *Pomatias*, which is abundant in Southern Europe, and is represented by isolated species in the Eastern Himalayas, the ranges south of the Assam valley, and the Arakan Hills, where one form is found. The shells are turrit in texture and finely ribbed. The *Cyclophoridae* (*Cyclotide* or *Cyclotacea* of many writers) comprise the great bulk of the operculated land shells of Burma and of the neighbouring countries. They are divided into three well-marked families. 1. The *Cyclophorinae*, discoid or conical shells frequently richly coloured or with a rough epidermis. 2. The *Diplommatinide*, discoid, conical, or ovate, all of one colour

throughout or nearly so, and nearly all having some raised sculpture across the whorls, and all, too, distinguished by a constriction at some distance behind the mouth, but in the ovate and turritidly ovate forms (*Diplommatina*) this constriction is more or less concealed by the last whorl. 3. *Pupinæ*, ovate or turritid shells, usually of one colour and often very richly coloured, destitute of constriction and as a rule of sculpture. They are usually larger shells than *Diplommatinidae*, many of which are very minute.

The genera of *Cyclophorinæ* found in Burma are four in number. *Cyclophorus* comprises discoid and turbinate shells, the former simple, coiled in the form of a disc and flat above, the latter conical above and rounded below (the spire being always considered the upper part and the mouth the lower). In this genus the spire is never much raised, the aperture is circular, destitute of notches, or projecting processes, and usually thickened, and the operculum is horny and nearly flat. In the subgenus *Scabrina* there is a rough epidermis, the operculum is thickened, and the margins of the whorls of which the operculum is composed consist of narrow free lamellæ; the shell is depressed and subdiscoidal. In *Pterocyclus* there is a small wing-like process covering the corner of the aperture where the peristome (or edge of the shell surrounding the mouth) joins the last whorl, and beneath this wing there is a deep notch in the shell. *Spiraculum* resembles *Pterocyclus*, but has in addition a tube open at both ends, at one end into the whorl and at the other end into the air, attached to the last whorl close to the suture a little behind the mouth. In both *Pterocyclus* and *Spiraculum* the operculum is horny, convex or flat, thick, with the edges of the whorls free. In *Rhiostoma* the mouth is free and furnished with a subtubular process projecting upwards in front; there is also a sutural tube, as in *Spiraculum*; the operculum is shelly, very thick, and deeply concave inside. *Leptopoma* is a conical shell, rather thin, with a thin horny operculum. *Lagocheilus* is subconical, and like a small *Cyclophorus*, but with a small vertical groove across the peristome, close to the place where it joins the last whorl.

The *Diplommatinæ* comprise *Alycaeus*, subdiscoidal or subconical, usually of small size, with a very marked constriction some distance behind the mouth, and, in many cases, strong ribbing transverse to the whorls behind the constriction. There is also a small tube running back from the constriction, for a greater or less distance, along the suture, opening into the whorl in front and closed behind. *Diplommatina* is subfusiform, elongately ovate, of minute size, with a sutural tube, generally white or amber-coloured, and usually with vertical ribs. *Clostophis* is only known from one specimen; it resembles *Diplommatina*, except that the last whorl is free and descending. It is far from certain that the solitary type is anything but a distorted *Diplommatina*.

The *Pupinæ* include four genera, but the species are few in number. *Megalomastoma* is a turritid thick shell, about an inch in length, with a circular aperture destitute of grooves or tubular processes. The operculum is thin and horny. The shell has a thick brown epidermis. *Hybocystis* is a solid shell, egg-shaped, flattened above the aperture, which is round and destitute of grooves or tubes. The operculum is shelly, multispiral outside, paucispiral within. This genus is the largest of the *Pupinæ*, being nearly one and a half inches in length and four-fifths of an inch in diameter. *Pupina* and *Raphaulus* are smaller shells, very highly polished and ovate in form; in the first the peristome is marked by deep transverse incisions, one above, the other on the left side; in the second there is a tube opening in the peristome itself, close to its junction with the last whorl, and running to a short distance outside the shell.

The *Helicinidæ* differ much in structure from the other families of land shells. The operculum is not round, but lunate, or semicircular, shelly, transparent, devoid of spiral structure, and in one genus, *Hydrocena*, furnished with an internal process. It should here be remarked that in all probability *Helicina* and *Hydrocena* really belong to different families. *Helicina* is a lenticular, smooth, or nearly smooth, form, whereas *Hydrocena* (*Georissa*) is subturritid or subconical, with rounded whorls, and, as a rule, with raised spiral sculpture. The few Burmese forms of *Helicina* are small, none exceeding one-third of an inch in diameter, but the species of *Georissa* are minute.

The true *Pulmonata* are nearly twice as numerous as the operculated land shells, and comprise, in the same manner, forms belonging to several families, although by far the greater portion are included amongst the *Helicidae*. The forms referred to the *Testacellidae* differ greatly from the typical genus, a carnivorous type of slug. But little is known of the habits of *Streptaxis* and *Eumea*; the former a peculiar hyaline shell more or less depressed, and with the lower whorls excentric from the axis of the upper, so as to have a remarkable appearance of distortion; the latter also hyaline but turrit or pupiform. Both have a peculiar bicoloured animal, red and white, or yellow.

The only true slug, *Limax viridis*, yet described from Burma is so imperfectly known that its generic relations are obscure; it is a small green species inhabiting mangrove bushes. The genus *Helicarion* however comprehends several slug-like mollusca, having the animal much too large for complete retraction into the shell, which is somewhat ear-shaped, thin, and with high lustre. *Vitrinopsis* is another *Vitruina*-like genus. *Ariophanta* is reversed, depressed and thin, with a sharp keel. *Macrochlamys* is composed of smooth discoid or subdiscoid shells, all very thin, with a thin lip and high lustre. The animal is provided with long linguiform processes to the mantle, and these processes, whilst the animal is crawling, are reflected over the upper surface of the shell. The relations of the shells referred to *Nanina* are less accurately determined, all are more or less discoidal, but with some sculpture above. *Sitala* consists of thin turbinate or subconical species, usually with some sculpture. *Hemiplecta* of comparatively large subdiscoid shells, sculptured above, smooth below. *Sophina* is a genus of discoid or subdiscoid species, smooth, thin, and resembling *Macrochlamys*, but remarkable for having a slit-like groove in the margin of the mouth below, near the axis of the shell. *Sesara* is lenticular or discoidal, ribbed transversely to the whorls above, smooth below; there are usually teeth in the mouth, and the lip is more or less thickened. *Trochomorpha* comprises thin, lenticular shells, very sharply keeled. *Plectopylis* consists of thick discoid shells, for the most part quite flat above and concave beneath; the lip is thickened and often toothed, and there is a remarkable barrier formed by teeth and transverse laminae in the whorls some distance behind the aperture. The true *Helices* found in Burma are not numerous, and are mostly distinguished by having the margin of the aperture slightly expanded; the majority are flat shells, but *H. capitiun* is conical and finely coloured. *H. bifoveata* is concave both above and below. The animals of the genera *Helicarion*, *Vitrinopsis*, *Ariophanta*, *Macrochlamys*, *Nanina*, *Sitala*, *Hemiplecta*, *Sophina* and *Sesara* have a large glandular depression sometimes, as in *Macrochlamys*, with a projecting lobe above, at the posterior extremity of the creeping disk or 'foot.' This is extremely minute in *Trochomorpha*, and wanting in *Helix* and *Plectopylis*; several other peculiarities of structure, such as a groove running along the edge of the foot, are also characteristic of the former group.

The other genera of the *Helicidae* are distinguished, as a rule, by being much more elongate or turrit. *Amphidromus* comprises some large handsome species conically ovate in form, lemon yellow in colour in parts, usually classed as *Bulimina*. Some of these shells are worn as an ornament by women in parts of Tenasserim. *Stenogyra gracilis* is a small white lustreless turrit shell, common throughout India and Burma; the animal is lemon yellow. *Glossula*, commonly classed as *Achatina*, consists of thin, horny, highly polished species, some with short, others with high spires. The mouth ends in an imperfect channel, which appears as if truncated below. *Hapalus* consists of whitish subovate shells of moderate size. *Pupa* of minute ovate forms, the mouth usually denticulate. *Hyposelostoma* is conical, or subdiscoidal, with the mouth free, expanding, and not opening, in the usual direction, but turned upwards or forwards. *Clausilia* is a turrit shell reversed, with teeth in the mouth, the peculiar sub-genus *Oospira* consisting of thick ovate shells, whilst in *Nenia*, a South American subgenus represented by one form in Pegu, and another in Upper Burma, the mouth is free and expanded.

The *Veronicellidae* are shell-less mollusks covered with a thick coriaceous mantle; the breathing and other orifices below the margin. The *Succineidae*, or amber snails, are named from their colour. They are thin shells, with large

mouths and a short spire, found in damp places and sometimes amongst the leaves of palm trees.

As a rule, all land shells are most abundant in the neighbourhood of limestone, and the limestone hills, so common in parts of Burma, usually abound in mollusks. Not infrequently some species are confined to the neighbourhood of limestone, and occasionally particular forms appear restricted to one hill or range of hills. There is a remarkable instance near Maulmain, one of the richest localities for land shells in the world. The various isolated limestone hills in the Salween and Attaran valleys are in many instances inhabited by peculiar species differing from those found at other hills. These hills are separated from each other by flat land liable to flooding, and it is very probable that the tract was formerly an archipelago, and that the sea occupied what are now the low flats of the Salween valley. This is probably the cause of the present isolation of the species occurring. Thus at the "Farm Caves" *Sophina schistostelis* and *S. discoidalis*, *Sesara pylaica*, *Clausilia philippiana*, *Streptaxis Sankryi*, *Hybocystis grandid* and *Raphaulus chrysalis* occur, none of which, Stoliczka says, are found on the perfectly similar limestone hill at Damotha (Dham-ma-tha), only fifteen miles distant, where, however, *Sophina forabilis*, *Sesara infrendens*, *Hydrocena* (*Georissa*) *livatula*, *Diplommatina carneola*, *Pterocyclus* (*Rhiostoma*) *Haughtoni*, etc., are met with.

Several of the above forms are peculiar so far as the Burmese area is concerned, no species of *Rhiostoma*, *Hybocystis*, or *Raphaulus* having been found elsewhere in Burma, whilst *Clostophis* and the peculiar type of *Clausilia* (*Oospira*), represented by *C. philippiana* and its allies, has not been discovered anywhere else in the world, and *Sophina* is almost peculiar. *Clostophis*, however, may, as already stated, be merely a distorted *Diplommatina*, no second specimen having been found. *Hybocystis* is found in Upper Siam, *Pterocyclus* (*Rhiostoma*) in Siam, Cambodia and Cochin-China, *Raphaulus* in Penang and Borneo, one species presenting some distinctions of no generic value, but distinguished as *Streptaulus*, being found in the Eastern Himalayas.

Leaving apart this very marked assemblage of species, the molluscan fauna of Tenasserim is on the whole closely allied to that of Siam and the Malay Peninsula, and has numerous connections with the forms existing in the Malay Archipelago. The fauna of the Mergui Archipelago has not been sufficiently ascertained to justify any conclusions; it is probably very rich. There is a marked distinction between the species found in Tenasserim and those inhabiting other parts of Burma, the latter being allied to Assamese and Himalayan types for the most part; but in the Thayet district of Pegu, and still more in Upper Burma, a very different association of forms is found, having some alliances with the species found in the Peninsula of India, and also some forms allied to Central Asiatic and Chinese types. There are thus at least four well-marked molluscan faunæ found in Burma, and it may perhaps be useful to notice some of the most characteristic. The provinces are the following:—

1.—Arakan and Southern Pegu. *Pomatias peguensis*, *Pterocyclus parvus*, *Alycaeus ingrami* and allies, *A. politus* and allies, *A. polygonoma*, *Pupina artata*, *Helicina arakanensis*, *Streptaxis burmanicus*, *Helicarion gigas*, *Sesara mammillaris*, *S. helicifera*, *Nanina textrina*, *Trochomorpha castra*, *Plectopylis plectostoma*, *P. karcuorum*, *Helix delibrata*, *Amphidromus sinensis*, *Glossula pertenuis*, *G. gemma*, *G. peguensis*, *Clausilia fusiformis*, *C. arakana*, *C. Theobaldi*.

2.—Upper Burma and Thayet district. *Helix similis*, *H. sculpturita*, *H. bolus* and allies, *H. capitum*, *H. tapeina* and allies, *Nanina pansa*, *Hypselostoma tubiferum*, *Pupa insularis*, *P. cænopicta* (the last two species not found in Pegu).

3.—Limestone Hills near Maulmain. *Aemella hyalina*, *Cyclophorus calyx*, *Pterocyclus ater*, *Rhiostoma Haughtoni*, *Alycaeus amphora*, *Diplommatina crispata*, *Hybocystis grandid*, *Raphaulus chrysalis*, *Georissa rawesiana*, etc., *Streptaxis petiti*, *S. bombæ*, and several other species, *Ennea cylindrelloidea*, *Vitrinopsis atarawensis*, *Sophina* several species, *Sesara infrendens* and allies, *S. pylaica*, *Plectopylis uchatina*, *P. cyclopsis*, *Hypselostoma dayanum*, *Clausilia* (*Oospira*) *philippiana* and allies, *C. insignis*.

4.—Tenasserim. *Cyclophorus expansus*, *Alycaeus pyramidalis*, *Megalomastoma sectilabrum*, *Pupina arula*, *Helicina merguensis*, *Ariophanta retrorsa*, *Macrochlamys resplendens*, *Nanina artificiosa*, *Situla arx*, *Hemiplecta saturnia*, *Helix merguensis*, *H. biforcata*, *Amphidromus atricallosus*, *A. janus*, etc."

Sub-order *PNEUMOBANCHILATA*.

Terrestrial air-breathers. Shell closed by an operculum, which is occasionally (*Diplommatina*) retracted out of sight from the aperture. Tentacles contractile simply, not retractile by inversion, as in the *Helicidae*. Sexes distinct. The operculum is very variable, being spiral and horny as in *Cyclophorus*; spiral and shelly as in *Hylocystis*; or non-spiral and shelly as in *Helicina*, with numerous curious modifications in different genera. The Burmese species embrace some of the smallest land shells as well as the largest found in that region.

Family **Truncatellidæ**.

*TRUNCATELLA*, *Risso*.

Operculum horny, subspiral. Apex of shell decollated.

„ *VALIDA*, Pfr. Arakan Coast.

These small shells are littoral in their habits, and always found close to the sea. They walk something like a leech, whence their name of 'looping snails.'

Family **Acmellidæ**.

*ACMELLA* *HYALINA*, Theob. and Stol.

Maulmain.

„ *MORELETIANA*, Nev.

Batte Malve. Nicobars.

„ *ROLPSTORFFIANA*, Nev.

Katchall. Nicobars.

The natural position of these small shells was regarded by Stoliczka as intermediate between the *Rissoide* and *Cyclophoridae*. The single species from Maulmain is extremely rare.

Family **Cyclophoridæ**.

Operculum spiral, horny, shelly; or composite, partly horny, partly shelly.

*POMATIASINÆ*.

*POMATIAS*, *Studer*.

Operculum cartilaginous, paucispiral, and formed of two laminae, one outer and one inner. Shell turritid.

„ *PEGUENSIS*, Theob. Gwah Hill. Arakan Coast.

*CYCLOPHORINÆ*.

*CYCLOPHORUS*, *Montfort*.

Operculum horny, multispiral. Shell turbate.

„ *PERNOBILIS*, Gould. Tenasserim.

A splendid shell of 64 mills. diameter. Mouth usually rich orange red, but sometimes white.

„ *ACRANTIACUS*, Schum. Amherst and Maulmain.

This is an equally fine shell, and seems the representative species of the last in Martaban.

„ *THEOBALDIANUS*, B. Tondoung near Thayet-myo.

The figure in the *Conchologia Indica*, pl. cxliv. fig. 2, is a var. of *C. speciosus*, Phil., and quite unlike Benson's species.

„ *FULGURATUS*, Pfr. Pegu. Mimbo.

This is a very variable shell in size and colour, ranging from 47 mills. to 31 mills. The lip is sometimes deep orange, sometimes pale or yellowish, and rarely white. In hot and arid spots a dwarf race is found of only 19 mills. diameter.

„ *WATENS*, W. Bl. Pegu and Arakan Hills.

A small solid race closely allied to the last.

*CYCLOPHORUS ARTHURITICUS*, Theobald. Hill ranges of Pegu.

This is a large and hypertrophied ally of *fulguratus*, ranging from 41 to 53 mills. Lip either white or orange.

„	<i>FLAVILABRIS</i> , B.	Pegu.
„	<i>EXCELLENS</i> , Pfr.	Martaban Province.
	<i>C. Haughtoni</i> , Theob.	
	<i>C. baltatus</i> , B.	
	<i>C. serratizona</i> , Thorpe.	

The general character of these shells is a funiculated coloured keel and a pale peripheral band. Not having seen the type, I follow Pfeiffer in accepting *C. excellens* as the common Maulmain shell.

„	<i>AFFINIS</i> , Theob.	Martaban Province.
„	<i>PHAYREI</i> , Theob.	Martaban Province.

The last three species are nearly allied and probably local races, each having a restricted range in the province of Martaban, or, in other words, incipient species in process of differentiation.

„	<i>SPECTOSUS</i> , Phil.	Martaban Province.
---	--------------------------	--------------------

A handsome and variable shell as to size and markings.

„	<i>OPHIS</i> , Hanley.	Tenasserim.
„	<i>EXPANSUS</i> , Pfr.	Tenasserim.

This species varies much in size.

„	<i>MALAYANUS</i> , Pfr.	Upper Salween Valley.
„	<i>PORPHYRITICUS</i> , B.	Tenasserim.
„	<i>SUBLEVIGATUS</i> , W. Bl.	Bhamo.
„	<i>CRYPTOPHALUS</i> , B.	Ava.
„	<i>CORNU-VENATORUM</i> , Sow.	Ava.
„	<i>SCURRA</i> , B.	Arakan Hills.
„	<i>ZEBENUS</i> , B.	Bhamo. Pensee.
„	<i>CHARPENTIERI</i> , MOISS.	
	var. <i>Nicobaricus</i> , Mart.	Nicobars.
( <i>CYCLOHELIX</i> )	<i>TURBO</i> , Chem.	Nicobars.
„	<i>CROCATUS</i> , Born.	Nicobars.
„	<i>FOLIACEUS</i> , Chem.	Andamans and Nicobars.
	<i>C. Leai</i> , Tryon.	

This solid shell, with its frills of varices, is of quite a different type from any of its allies on the mainland.

The flat discoidal *Cyclophori* may be conveniently separated from the turbate species. The small Burmese species have been referred to *Scabrinia*.

( <i>SCABRINA</i> )	<i>CALYX</i> , B.	Maulmain. Farm Caves.
„	<i>INGLISIANA</i> , Stol.	Damathat Hill.
„	<i>HISPIDULA</i> , W. Bl.	Mya-leit-doung. Ava.

*LAGOCHILUS*, Theobald.

These are small turbate forms, with a notch in the peristome.

„	<i>SCISSIMARGO</i> , B.	Phaiethan Hill. Tenasserim.
„	<i>TOMOTREMA</i> , B.	Arakan.
„	<i>LEPORINUS</i> , W. Blanford.	Thayet-myo. Akouktoung.
„	<i>WALKERFORDIANUS</i> , G. Nevill.	Andamans. Nicobars. Great Coco.
„	<i>ROEPSTORFFI</i> , Moreh.	Nicobars. Kamorta. Katchall.
„	<i>GALATHEE</i> , Moreh.	Nicobars. Kamorta. Katchall.

Other species are *L. trochoides*, Stol., and *L. striolatus*, from Penang. *L. garreli*, Eyd. et Soul, Sumatra. *L. polygema*, Moreh, Teressa.

LEPTOGOMA, *Pfeiffer*.

These are small light thin shells, the animals being of arboreal habits, but with no very marked characters.

„	ASPURANS, B.	Pegu and Tenasserim.
„	ROLPSPORFFIANUM, G. Nev.	Andamans.

DERMATOGYTRA, *H. and A. Adams*.

This genus is distinguished by carrying an erect horn on the extremity of the foot. One species is referred to it by Nevill with doubt.

„	IMMACULATUM, Chem.	Nicobars. Katchall.
---	--------------------	---------------------

PTEROCYCLOS, *Benson*.

Operculum horny, multispiral, concave within, lamellated without. Shell depressed, widely umbilicated. A wing-like dilatation of the peristome at the suture.

„	ATER, Stol.	Ataran Valley.
„	ARAKANENSIS, W. Bl.	Tounglup, Arakan.
„	CERA, B.	Phaethan Hill, Tenasserim.
„	FEDDENI, W. Bl.	Pegu.
„	INSIGNIS, Theob.	Upper Salween Valley.
„	PARVUS, Benson.	Sandoway.
„	PULLATUS, B.	Pegu.

RHIOSTOMA, *Benson*.

Last whorl free towards the mouth, with a straight porrect tube in place of the wing of *Pterocyclos*, and a deeply cupped shelly operculum, the convexity external.

„	HAUGHTONI, Benson.	Maulmain.
---	--------------------	-----------

SPIRACULUM, *Benson*.

A sutural tube in addition to the wing (of *Pterocyclos*). Operculum shelly, flat or convex (cupped).

„	AVANUM, W. Bl.	Ava and Pegu.
„	ANDERSONI, W. Bl.	Bhamo.
„	BHAMOENSE, Theob.	Bhamo.
„	BILURIFERUM, Theob.	Bhamo.
„	(OPISTHOPORUS) GORDONI, B.	Maulmain. Toung-ngoo.

JERDONIA, *W. Blanford*.

Operculum multispiral of two laminae, the inner horny, the outer shelly. Shell small, turbinate.

„	PHAYEEI, Theob.	Upper Salween Valley.
<i>Cyclyphorus biliratus</i> , Beddome ( <i>vide</i> Hanley).		

## PUPININÆ.

Shell turritid, more or less tumid.

MEGALOMASTOMA, *Goulding*.

Operculum thin, horny, multispiral.

„	SECTILABRE, Gould.	Yanglaw. Tenasserim.
---	--------------------	----------------------

RHAPHACUS, *Pfeiffer*.

Operculum thin, horny, multispiral. Shell thin, rugose. Mouth circular, with expanded peristome, and a short tube adnate to the peristome. Tentacles long.

„	CHRYSALEIS, Pir.	Farm Caves, Maulmain.
---	------------------	-----------------------

In this species the peristomial tube lies in the same plane with the peristome.

„	PACHYSIPHON, Theob. et Stol.	Kwengan.
---	------------------------------	----------

In this species the peristomial tube is bent back behind the peristome.

*HYALYSIS, B.*

Operculum thin, shelly, multispiral, with a well-marked scar of attachment internally. Shell thin, but tumid.

..	GRANITA, B.	Damthar Caves. Farm Caves.
..	CHALCIDA, B. (jun.)	

*PERNA, B.*

Operculum thin, bony, multispiral. Shell pugilina, lustrous; mouth circular, with a suture on each side.

..	ARILA, B.	Yunglaw. Tada-U-shin.
..	ATATA, B.	Pagan and Arakan.
..	BEANYI, Theob.	Pagan.
..	PERLANSIS, B.	Singay-gyng, Zwegabin.
..	HEN-THA-THANA, G. N. Yell.	Hsailin K. N. Salween Valley.
..	NE-PARDA, Pir.	Great N. of Ar.
..	NE-PARDA, Pir.	The N. of Ar.

*Family Diplommatinidæ.*

## DIPLOMMATININÆ.

*DIPLOMMATINA, B.*

Operculum minute, bony, reticulated, very slightly from the aperture. Shell small, tumid in the middle, the penultimate whorl being constricted. Columella twisted.

..	APPINIS, Theob.	Upper Salween Valley.
..	CALNEOLA, Stoll.	Damthar Caves.
..	FALIS, W. Bl.	Myi-sen-tung, Ava. Farm Caves.
..	GLAIFL, W. Bl.	Akyab.
..	NANA, W. Bl.	Akyab, on Irrawaddy R.
..	DELITUS, W. Bl.	Phung-lon near N. of Ar.
..	DELITIBUS, R.	Natogyin in Western Pegu. Maulmain. Samlway.
..	TUPPELOMIS, Theob.	Upper Salween Valley.
..	UPPENSIS, W. Bl.	Phung-lon, Ava.
..	RICHIBFENI, Theob. et Stoll.	Tungstalin, Maulmain.
..	SCALABOIDEA, Theob.	Ava.
..	SALWINIANA, Theob.	Upper Salween Valley.
..	SIFRATA, W. Bl.	Ningbo, Arakan Hills. M. H.
..	PALATINA ANGULATA, Theob. et Stoll.	Chenki-dun, South of Maulmain.
..	CRISPATA, Stoll.	Damthar and Farm Caves.
..	CLOSTHIS-SANKEAL, B.	Farm Caves. Maulmain.

No second specimen has ever been discovered. It may be a distorted *Diplommatina*.

## ALYCEINÆ.

*ALYCEUS, Gray.*

Operculum subtestaceous, multispiral. Shell turritate or depressed, constricted behind the aperture, and with a sutural tube of variable length.

..	AMPHORA, B.	Farm Caves. Kungun Caves.
..	ARMILLATUS, B.	Tadong, near Thayet-myo.
..	AVE, W. Bl.	Hills East of Mandalay.
..	ANDAMANTE, B.	Andamans.
..	RIFENS, Theob.	Upper Salween Valley.
..	CRISPATUS, Gohl.-Ars.	Maulmain.
..	CUCULLATUS, Theob.	Upper Salween Valley.
..	FEDDENATUS, Theob.	Upper Salween Valley.
..	GLAPHIUS, W. Bl.	Ching-lay sukun. Arakan Hills.
..	GLABER, W. Bl.	Akyab.



ALYCEUS HUMILIS, W. Bl.	Arakan Hills. Myancung.
„ INGRAMI, W. Bl.	Arakan Hills.
„ KURZIANUS, Theob. et Stol.	Nattoung in Western Prome.
„ MARGARITA, Theob.	Upper Salween Valley.
„ POLITUS, W. Bl.	Phoungdo, near Cape Negrais.
„ POLYGONOMA, W. Bl.	Arakan Hills.
„ PYRAMIDALIS, B.	Therapon Hill, Tenasserim.
„ PUSILLUS, Godt.-Ams.	Nattoung in Western Prome.
„ RICHTHOFENI, W. Bl.	Kangun and Farm Caves, Maulmain.
„ SUCINEUS, W. Bl.	Moditoung, Arakan Hills.
„ SCULPTILIS, B.	Tondoung, near Thayet-myo.
„ URNULA, B.	Mali in Arakan. Attaran Valley.
„ UMBONALIS, B.	Akouktoung on the Irrawaddy R.
„ VESTITUS, W. Bl.	Moditoung, Baumi. Akyab.
„ VULCANI, W. Bl.	Puppadoung.

### Family Cyclostomidæ.

#### OMPHALOTROPIS, Pfeiffer.

Mr. W. T. Blanford, who has recently described three species of this genus, justly remarks that it is unknown in India or Burma, being confined to the Islands, and is especially common in the Mascarene Islands and in Polynesia. The shells are perferate, with an umbilical keel more or less distinct.

„ DISTERMINA, B.	Andamans.
„ ANDERSONI, W. Bl.	Andamans.
„ PALLIDA, W. Bl.	Andamans.
„ DECUSSATA, W. Bl.	Andamans.
„ CONODIA, Fr.	Nicobars.

### Family Helicinidæ.

#### HELICININÆ.

#### HELICINA, Lamarck.

Operculum lunate, shelly and devoid of spiral structure. The animals of this genus possess the power, in common with the *Veritidæ* and *Auriculidæ*, of dissolving the internal or columella portion of their shells, thereby obtaining more room for the comfortable disposition of their stomachs and other organs when adult. The species are mostly insular or littoral in their distribution.

„ ARAKANENSIS, W. Bl.	Bassein. Ramri and Andamans.
„ ANDAMANICA, B.	Andamans. Nicobars and Cocos.
„ CROCINA, B.	Toung-ngoo.
„ MERGULSIS, Pfr.	Mergui.
„ SCRUPULUM, B.	Andamans.
„ DUNKERI, Zel.	Camorta. Preparis Island.
„ BEHNIANA, Pfr.	Nicobars.
„ NICOBARICA, Phil.	Nicobars.

This genus may be regarded as somewhat feebly represented on the mainland or Burma proper; the species being small and the individuals not numerous. The finer and more typical forms are from the West Indies.

#### HYDROCENINÆ.

#### HYDROCENA, Parryess.

The shells of this genus are minute, turbinate, and generally spirally striated, and harbour under stones or adhere to rocks. The operculum is shelly and furnished interiorly with a slender spine-like process.

„ BLANFORDIANA, Stol.	Chouktalon and Farm Caves.
„ FRUSTRILLUM, R.	Mya-leit-doung, Ava.

HYDROENA TRAILLENA, Theob. et Stol.	Chauktalon. South of Maulmain.
„ HUX, B.	Phaithan Hill, Tenasserim.
„ LUCIOLA, Stol.	Danathat and Toungtalon Hills.
„ PYRIS, B.	Tonaboung, Thayet-myo.
„ RAWLSIANA, B.	Farm Caves, Maulmain.
NIRRHINA, <i>Lamarck</i> .	

The *Neptomas* are mainly inhabitants of fresh or brackish waters and in Burma are particularly fine and numerous within the tidal portion of its streams. They are often externally coated with a lustrous glaze, deposited on them by running water, which entirely conceals and disguises their true colour and is not easy to remove. Their spire is often much eroded from the excess of carbonic acid in the water wherein they reside, as is the case with *Melania* and *Unio* from a like cause.

„ ARTICULATA, Gould.	Tavoy.
„ BENGALENSIS, Chem.	Pegu.
„ CORNUCOPLE, B.	Pegu.
„ <i>N. melanostoma</i> , Trösc.	
„ DEPRESSA, B.	Pegu.
„ INDICA, Sow.	Tavoy.
„ OBUSA, B. (apud Sow.)	Pegu.
„ PELLIGERA, Lam.	Andamans.
„ <i>N. Knorrli</i> , Recl.	
„ ORBICULARIS, Sow.	Pegu.
„ <i>N. capillulata</i> , Gould.	Tavoy.
„ <i>N. humeralis</i> , B.	
„ <i>N. fuliginosa</i> , Theobald.	Ava.
„ <i>N. cryptospira</i> , B.	Tenasserim.
„ <i>N. retifera</i> , B. (apud Blanford).	
„ <i>N. Peguensis</i> , W. Blanford.	Pegu.
„ RUBIDA, Pease.	Andamans.
„ SMITHII, Gray.	Pegu and Arakan.

#### NAVICELLA, *Lamarck*.

Operculum rudimentary, shelly, concealed. Shell oval, patelliform, attached to stones or the bottoms of boats in salt or brackish water.

„ ORBICULARIS, Sow.	Andamans.
---------------------	-----------

### Family Trochidæ.

\*PHASIANELLA LINEOLATA, Gray.

\* „ VENTRICOSA (?), Quoy.

#### Sub-Family TURBININÆ.

##### TURBO, *Linnaeus*.

Shell top-shaped. Aperture subcircular. Smooth. Operculum convex without, shelly, with a horny base displaying a 'scar' of attachment.

The operculum is usually smooth outside, but is sometimes warty, as in *T. sarmaticus*, L., the operculum of which is actually figured in one of the Bridgewater treatises as the 'epiphragm' of *Helix pomatias*, the edible snail of Southern Europe! The loose opercula of the larger *Turbos* were a source of wonder and perplexity to the earlier naturalists, by whom they were named 'Venus navels,' from the neatly-coiled snub little twist of their muscular scars. Now-a-days we have grown much too delicate to tolerate even a 'simile' borrowed from the anatomy of a goddess, but this refinement in our tastes can hardly be held to have extended to our 'morals,' as our tables unblushingly display the advertisements of artists, in every branch of what a Chinaman would designate as the 'lie business' of personal decoration, from "curled fringes" to "dress-improvers" ('pseudo-pygæ'), and all the rest of it, with copious illustrations at which our so-called coarser ancestors would have blushed.

- \*TURBO RADIATUS, Reeve.
- \* „ PETHOLATUS, L.
- \* „ PORPHARITICUS, Gmel.
- \* „ CORONATUS, Gmel.
- \* „ ARGYROSTOMA, L.

*Sub-family* ROTELLINÆ.

ROTULA, *Lamarck*.

Shell highly polished, handsomely variegated, and with a large umbilical ‘callus.’ Operculum thin, horny.

- \* „ sp.

A species of this genus is found buried in the sands in countless numbers along the Arakan Coast. The advancing waves wash them out, but they soon bury themselves again when the water retreats.

Order SCUTIBRANCHIATA.

Gill consisting of two series of lamellæ over the neck or under the edge of the mantle. Sexes united (Hermaphrodite). The *Scutibranchiata* embrace a vast number of species, mostly littoral in their habits, and nestling among the sea weeds and rocks along the shore. They are vegetable feeders, and comprise spiral shells, as *Nerita* and *Trochus*; patelliform shells as in *Patella* and *Fissarella*; and multivalve shells like *Chiton*.

Sub-order *PODOPHTHALMA*.

Eyes pedunculate. Shell and operculum spiral.

*Family* Neritidæ.

NERITA, *Linnaeus*.

Operculum horny, solid, with a shelly coat on each side, the outer surface usually granular.

- \* „ POLITA, L. Andamans.
- \* (PILA) CHRYSOSTOMA, Reeve.
- \* „ COSTATA, Chem.
- \* „ Plicata, L.
- \* (THELIOSIYLA) ALBICILLA, L. Andamans.
- \* „ BURMANICA, Phil.
- \* „ squamulata, Le Guillou.
- \* „ ATROFURPURA, Recluz.
- \* „ ORYZARUM, Recluz.

*Sub-family* TROCHINÆ.

Operculum horny, multispiral.

- \*DELPHINULA PERONI, Kien.
- \*TROCHUS NILOTICUS, L.
- \* „ OBELISCUS, Lam.
- \* „ STELLATUS, Gmel.
- \* „ INDISTINCTUS, Gray (non Phil.).
- \* „ TRANQUEBARICUS, Chem.
- \* „ PUNCTATUS, Andamans.
- \*POLYDONTA squarrosa, Lam.
- \* „ MACULATA, L.
- \* „ INCARNATA, Phil. Andamans.
- \*(INFUNDIBULUM) RADIATUM, Dillwyn.
- CLANGLUS MICRODON, H. Adams. Andamans.

MONILEA	WARNEFORDI, G. and H. Nevill.	Andamans.
„	CALYCEUS, Wood.	Andamans.
„	<i>T. Masoni</i> , G. and H. Nevill.	
„	CALLIFERA, Lam.	
FORSKÄLLA	PULCHERRIMA, A. Adams.	Andamans.
ECHELUS	FOSSALATUS, Sowerbie.	Andamans.
„	FOVEOLATUS, A. Adams.	Andamans.
*MONODONTA	THICARINATA, Lam.	
* „	CANALIFERA, Lam.	
* „	VIELLOTI, Payrand (a Mediterranean species), Hanley MS.	
Mr. G. Nevill, however, questions the correctness of this identification.		
GIBBULA	BLANTFORDIANA, G. and H. Nevill.	
„	STOLICZKANA, G. and H. Nevill.	

## STOMATELLINÆ.

Foot thick, fleshy, developed posteriorly. Operculum thin, horny, paucispiral, often wanting.

BRODERIPPIA, *Gray*.

Shell non-spiral, ancyliiform, ovate.

\* „ IRIDESCENS, Brod.

Family **Haliotidæ**.

Operculum none. Shell ear-shaped, with a series of marginal holes. Internally nacreous and iridescent.

\*HALIOTIS OVINA, Dillwyn.

\* „ VARIA, L. Andamans.

\* „ SEMISTRATA, Reeve.

Sub-order **EDRIOPHTHALMA**.

Eyes sessile, or on slightly raised tubercles on the outer bases of the tentacles. Operculum none. Shell symmetrical, non-spiral, aperture not pearly.

Family **Fissurellidæ**.

Shell either pierced at the apex, or grooved or fissured anteriorly.

\*FISSURELLA, sp.

SCUTUS, *Montfort*.

Shell depressed, shield-shaped, more or less covered by the mantle. White. Apex at the hinder third. The animal black.

\* „ CORRUGATUS, Reeve.

Family **Tecturidæ**.

The “false limpets,” as they are called, are distinguished from the *Patellidæ*, by the gill being single and placed in a cavity in the right side of the neck, instead of forming a series of laminae between the mantle and foot.

\*TECTERA FLUVIATILIS, W. Blanford. Bassein River.

„ BORNEONENSIS. Andamans.

Family **Patellidæ**.

Shell conical. Gill, a more or less complete ring on the inner surface of the mantle.

Limpets sometimes excavate (on calcareous rocks) shallow roosting places for themselves, but can crawl about over the rocks for short distances. They are largely used for bait, and are wholesome food for man.

- \*PATILLA TESTUDINARIA, L.
- \* „ SACCHARINA, L.
- \* „ RADIALA, Born.
- \* „ ASTER, Reeve.

### Family Chitonidæ.

Shell formed of eight transverse imbricated plates immersed in the coriaceous mantle which forms an expanded margin beyond them. Sexes united.

CHITON NICOBARICUS, Chem.

Abounds on surf-beaten rocks in company with limpets, and is gathered for food.

### Order PULMONATA.

Terrestrial, marsh or fluviatile, inoperculate mollusks, which breathe air directly by means of a vascular lung chamber.

Sexes united (Hermaphrodite). With a few exceptions the members of this order are herbivorous, a few shell-less forms feed on worms and other mollusks. The tentacles are retractile by inversion, as may be noticed in the common garden snail *Helix aspersa*.

The earliest contribution to our exact knowledge of the land shells of Burma was made by Dr. Mason forwarding to Dr. Gould a collection of thirty-five species, made in Tenasserim, and, about the same time, Mrs. Vinton also forwarded to the same gentleman shells from both the Thoungyeen and Tenasserim Rivers. The largest land shell sent was *Cyclophorus perobolis*, Gould, a richly coloured species, which the Karens (according to Dr. Mason) call the 'primary shell,' *i.e.* the one from which the others are derived. The Burmans call it the 'quet' shell, as they say it calls out 'quet, quet.' With reference to sounds produced by snails, it may be remarked that the noise made by the common English snail, crawling on the outside of a window pane, during the still hours of night, and scraping over the glass with its shell, is alarming to the timid and has served for the foundation of many a ghost story, or of stories of mysterious sounds and occurrences which belong to that order of narratives. Another handsome shell, then first sent, was *Bulinus atricollis*, Gould, which the Karen maidens wear as an ornament to their buxom persons and name the 'heron's dung' shell. The next considerable collection of land shells was made by myself, and most of the new shells were described by Mr. Benson in the Annals and Magazine of Natural History. Still later additions to our knowledge of the subject were made by Messrs. W. T. Blanford, Fedden, Stoliczka and myself, and in Upper Burma by Dr. Anderson when on the Yunnan expedition.

### Sub-order GEOPHILA.

#### Family Oleacinidæ.

OPEAS GRACILIS, Hutton.

Throughout India and Burma.

*Achatina octona*, Gould.

Abounds everywhere, and is often associated with *Ennea bicolor*. Animal yellow.

„ WALKERI, B.

Andamans. Salween Valley.

„ TEREBRALIS, Theobald.

Upper Salween Valley.

„ NICOBARICA, Mösch.

Nicobars.

PRO-OPEAS HAUGHIONI, B.

Andamans.

*Opeas Prævi*, Tryon.

This heavy shell, with a thick epidermis, is sufficiently distinct from its allies to be generically separated. It seems confined to the Andamans.

PROSOPEAS ROEPSTORFFI, Mörch.	Nicolbars. Little Coco.
„ ACHATES, Mörch.	Nicolbars.
„ ACHATINACEA, Pfr.	Canorta. Sarawak.
„ COMOROENSIS, Pfr.	Comoro.

BACILLUM, *Theobald.*

This genus, type *B. obtusum*, forms a well-marked group wholly distinct from the type *G. gemma*. The shells are turritid and of a peculiar white diaphanous waxy structure, with or without a deciduous epidermis. They seem intermediate between *Opeas* and *Glossula*, with nearer relations to the former.

„ OBTUSUM, W. Blanford.	Blanno.
„ THEOBALDI, Hamley.	Upper Salween.

Not the erroneous locality, Teria ghat, given in the Con. Ind. Pl. xii.

„ ORTHOCERAS, God.-Aust.	Khasi Hills. Andamans! <i>vide</i> Mr. Wood-Mason's collector.
--------------------------	--

HAPALUS PLICIFER, W. Bl.	Pegu.
„ PUTUS, B.	Pegu.
„ FUSILLUS, W. Bl.	Pegu.
„ SCROBICULATUS, W. Bl.	Pegu.

GLOSSULA, *Albers.*

Thin polished shells, elongated and turritid, or globose. The Burmese species are uniform in colour and devoid of any markings. They are found on the ground amid decayed vegetable matter.

„ BLANFORDIANA, G. Nevill.	Ponsee, Yunnan.
„ PEGUENSIS, W. Bl.	Irrawaddy Valley. Arakan.
„ GEMMA, B.	Arakan.
„ <i>G. frumentum</i> , Reeve.	
„ PERTENCUS, W. Bl.	Toungoup, Arakan.
„ PYRAMIS, B.	Ponsee, Yunnan.
„ SUBFUSIFORMIS, W. Bl.	Ponsee, Yunnan.
„ TENCUSPIRA, B.	Pegu.

SOPHINA, *Benson.*

These shells are thin and hyaline, with the columella thickened, notched, and forming an angle with the outer lip, and with the umbilicus ridged.

„ CALIAS, B.	Maulmain.
„ <i>S. schistostelis</i> , B.	
„ CONJUGENS, Stol.	Maulmain.
„ DISCOIDALIS, Stol.	Maulmain.
„ FORABILIS, B.	Maulmain. Tenasserim.

MACROCHLAMYS, *Benson.*

This genus comprises a vast assemblage of very varied character of what may be termed 'common snails.' The surface in some is polished, and these are furnished in many instances with processes of the mantle capable of extension over the whole shell. Some have a dull epidermis, and some few are handsomely sculptured, as *M. artificiosa*, of which, however, the animal is unknown.

„ ARTIFICIOSA, B.	Phaichan Hill. Tenasserim.
„ ASPIDES, B.	Tenasserim.
„ ATKINSONI, Theobald.	Maulmain.
„ BICMANA, Pfr.	Tenasserim.
„ <i>M. acerra</i> , B.	
„ CHOINIX, B.	Andamans.
„ CLIMACTERICA, B.	Arakan Hills.
„ COMPLUVIALIS, W. Bl.	Arakan Hills.
„ CONVALLATA, B.	Therapon Hill. Tenasserim.

This species and the previous one are local representatives each of the other.

MACROCHLAMYS CONSETTA, R.	Damathat Caves, Maulmain.
„ CYCLOIDEA, Alters.	Maulmain.
„ CASSIDULA, B.	Maulmain.
„ CAUSIA, B.	Phaethan Hill, Tenasserim.
„ DIDRICHSENII, Mörch.	Nicobars.
„ FAUL, Theobald.	Andamans.
„ <i>M. Andamanensis</i> , Tryon.	
„ GORDONLE, B.	Maulmain.
„ HONESTA, Gould.	Arakan, Pegu, Tenasserim.
„ HYPOLEUCA, W. Bl.	Arakan Hills, Pegu, Bhamo.
„ INDICA, B.	Pegu ( <i>vide</i> Blanford).
„ <i>M. vitrinoides</i> <i>caucorum</i> , not Deshayes.	
„ <i>M. petrosa</i> , Hutton.	
„ KUMAHENSIS, Theob. et Stol.	Kumah Hill, Sandoway.
„ LEUCULA, B.	Tenasserim, Pegu.
„ MOLLICULA, B.	Pegu, Martaban.
„ NEBULOSA, W. Bl.	Pegu.
„ PAUCILLULA, B.	Thayet-myo.
„ PETASUS, B.	Tenasserim.
„ PERTAULA, B.	Arakan, Pegu, Maulmain.
„ POONGI, Theobald.	Maulmain.
„ RESPLENDENS, Phil.	Mergui, Bhamo (Nevill).
„ STEPHUS, B.	Andamans.
„ RAMIENSIS, W. Bl.	Ramri.
„ ROUSSEI, Mörch.	Nicobars.
„ TETRINA, B.	Pegu.
SITALA ATLEGIA, B.	Pegu, Ava.
„ ARX, B.	Therapon Hill, Tenasserim.
„ CONFINS, W. Bl.	Thayet-myo, Ava.
„ GRACILIOR, W. Bl.	Irrawaddy Valley.
„ LIRIOCEFA, Stol.	Maulmain.
„ CONULA, W. Bl.	Arakan.
KALIELLA FASTIGIATA, Hutton.	Arakan ( <i>vide</i> Nevill).
„ PARAKORENSIS, Pfr.	Bhamo (Nevill), Pegu.
„ POLYPLURIS, W. Bl.	Arakan Hills.
A local representative of the Khasi Hills <i>K. bascunda</i> , B.	
SESARA, <i>Albers</i> .	

A well-marked group of shells peculiar to Burma, but some of them bearing a considerable resemblance to the little North American *H. hirsuta*, Jay.

„ INERMIS, Theob.	Ataran Valley.
„ ATARANENSIS, Theob.	Banks of the Ataran.
„ HUNGERFORDIANA, Theob.	Salween Valley.
„ CAPESENSIS, B.	Maulmain.
„ INFERENDENS, Gould.	Maulmain, Tavoy.
„ <i>S. Tickelli</i> , Theob.	
„ PYLAICA, B.	Maulmain.

The three which follow belong to a different division to the above.

„ BASSEINENSIS, W. Bl.	Bassein District.
„ HELICIFERA, W. Bl.	Arakan Hills.
„ MAMMILLARIS, W. Bl.	Western Prome.
ROTULA ANCEPS, Gould.	Pegu, Martaban.
„ ARATA, W. Bl.	Bhamo.

This, if distinct, is the local representative of the last.

„ DIPLODON, B.	Khasi Hills, Bhamo, Arakan.
„ INGRAMI, W. Bl.	Arakan Hills.

This is the local representative in Arakan of the last.

„ PANSA, B.	Irrawaddy Valley.
-------------	-------------------

ARIOPHANTA UNDOSA, W. Bl.	Shan Hills, east of Ava.
„ BLANFORDI, Theob.	Upper Salween Valley.
„ ELIOTI, Gould.	Tenasserim.
„ <i>A. saccata</i> , Pfe. juv.	
„ SATURNIA, Gould.	Tenasserim.
„ ATER, Theob.	Maulmain. Hills west of Toung-ngoo.
RHYSOTA HAUGHTONI, B.	Andamans.
TROCHOMORPHA ACLOTIS, B.	Andamans.
„ CASTRA, B.	Arakan. Pegu. Tenasserim.
„ PERCOMPTRESSA, W. Bl.	Blamo.
„ SANIS, B.	Andamans.
HELICARION, <i>Frussae</i> .	

These are mostly large slug-like forms, with the shell sometimes membranous or rudimentary, and only seen about after, or during heavy rain. The animal is too large for retraction within its shallow depressed shell.

„ BIRMANOTUM, Phil.	Mergui.
„ CHRISTIANE, Theob.	Andamans.
„ GIGAS, B.	Kyauk-hpyoo (Nevill).
„ MAGNIFICUS, God.-Aus.	Momien, Yunnan (Nevill).
„ PEGUENSIS, Theob.	Pegu. Tenasserim.
„ RESPLENDENS, Nev.	Sawady and Blamo.
„ VENUSTUS, Theob.	Martaban and Arakan Hills.

CRYPTOSOMA, *Theobald*.

Differs from *Helicarion* in the animal being completely retractile within its shell, and in forming a stout epiphragm during restivation.

„ OVATUS, H. Bl.	Pegu (small var.).
„ PRESTANS, Gould.	Yunan. Arakan. Pegu. Tenasserim.
HYALIMAX REINHARDTI, Mörch.	The Nicobars.
„ sp.	Andamans.

LIMAX VIRDIS, *Theobald*.

A beautiful little apple-green slug, found crawling on mangrove leaves (*Rhizophora*). The type specimen has been lost, and its systematic position is uncertain.

Family **Helicidæ**.

No caudal mucous pore or tentacular lobe.

VITRININÆ.

HELICOLIMAX ATTARANENSIS, Theob.	Banks of the Attaran.
----------------------------------	-----------------------

This slug (with *Sesaya Attaranensis*) was discovered by myself near the perforated hill on the Attaran, and is the sole member of its sub-family at present known in Burma. A second species, *Vitrinopsis nucleata*, Stol., was found by Stoliczka at Pinang.

HELICINÆ.

PLECTOPYLIS, *Benson*.

This is a very well-marked group of flat closely-wound shells, the typical forms of which range from the Naga Hills to Tenasserim. In Ceylon they are represented by *Corilla*, which externally resembles them, but is unprovided with the curious pylæic barriers, or intricate plaits, which partially close and bar the last whorl. For full remarks on this interesting group, see Godwin-Austen, Proc. Zool. Soc. Lond. 1874, p. 608, and 1875, p. 43. It is suggested (*loc.*) that these pylæic barriers are of service to the animals, by excluding insects, and so tending to promote the survival of the forms thus endowed; but these teleological arguments must be



accepted with extreme caution, as it is the minority who are thus gifted; and it is difficult to imagine the precise utility of a structure (that is, *quoad* any effect it may have in the preservation of the species), which is wholly exceptional, and not found to be essential to the well-being of the vast majority.

PLECTOXYLIS ACHATINA, Gray.	Farin Caves, Maulmain.
<i>P. repersussa</i> , Gould ( <i>vide</i> G.-Austen).	Tavoy. Mergui.
ANDERSONI, W. T. Bl.	Yunan.
ANGUINA, Gould.	Tavoy. Damathat Caves.
BRACHYBISCUS, God.-Aust.	Moolyit Hill, east of Maulmain.
BRACHYPLECTA, B.	Near Maulmain.
CYCLASPIS, B.	Damathat and Kaung Caves.
DEXIRORESA, B.	Phaie-than Hill, Tenasserim Valley.
KARENORUM, W. T. Bl.	Henzadah District.
PLECTOSTOMA, B.	Arakan. Khasi and Naga Hills.
FEDDENI, W. T. Bl.	Prome. Thayet-myo.
PERARCTA, W. T. Bl.	Mya-let-doung. Ava.
PSEUDOPHIS, W. T. Bl.	Thayet-myo.
REFUGA, Gould.	Akouktoung. Kwaydouk.
<i>P. leiophis</i> , B.	
SHANENSIS, Stol.	Upper Salween Valley.
<i>P. trillamellaris</i> , God.-Aust.	
PLECTROTROPIS AKOUKTOUNGENSIS, Theob.	Akouktoung on the Irrawaddy R.
ARAKANENSIS, Theob.	Arakan Hills.
BOLUS, B.	Irrawaddy Valley. Pensee, Yunan.
ELMIOPHA, B.	Andamans.
HUFFONI, Pfr.	Irrawaddy Valley.
OLDHAMI, B.	Irrawaddy Valley.
PANSA, B.	Irrawaddy Valley.
PEGUENSIS, W. Bl.	Pegu.
PERPLANATA, Nevill.	Mimboo, Yunnan.
PHAYREI, Theob.	Ava.
PILIDON, B.	Maulmain.
ROTATORIA, V. d. Busch.	Irrawaddy Valley.
SIMILARIS, Fer.	Irrawaddy Valley.
SCALPURITA, B.	Irrawaddy Valley below Ava.
SCENOMA, B.	Maulmain.
TRICHOPTROPIS, Nev.	Irrawaddy 2nd defile.
ZOROASTER, Theob.	Prome. Ava. Tsagain. Manwyne.
SEMICORNU BIFOVEATUM, B.	Therapon Hill, Tenasserim Valley.

A single adult shell was all that I found of this remarkable form (W. T.).

JANIRA CODONOPES, Pfr.	Nicobar Islands.
TRACHIA ANSERINA, Theob.	Shan States.
CATASTOMA, W. Bl.	Ponsi in Yunan.
PROCUMBENS, Gould.	
<i>delibrata</i> , B.	Irrawaddy Valley. Tenasserim.
GABATA, Gould.	Maulmain. Tavoy.
<i>H. Merguensis</i> , Phil.	
HELPERI, B.	Andamans.
MERGUENSIS, Pfr.	Maulmain. Tenasserim.
TROCHALIA, B.	Andamans.
<i>R. Bigsbyi</i> , Tryon.	

A peculiar type of shell, very different from *T. falluciosa*, next to which it is placed in Nevill's Hand-list.

GANESSELLA CAPITIFRUM, B.	Pegu and Upper Burma; also Bengal.
<i>G. hariola</i> , B.	

This rare shell is found on the '*Shah bew*,' *Phyllanthus emblica*, L. (W. T.).

## BULIMINÆ.

AMPHIDROMUS, *Albers*.

The shells of this group are handsome brightly coloured shells, and are either uniformly coloured or have handsome markings. The yellow *B. atricallus*, Gould, is called, according to Dr. Mason, the 'heron's dung' shell, and is worn as an ornament by the Karens. Gould's shell is not figured in the *Conchologia Indica*.

„	ANDAMANENSIS, MOUSS.	Andamans.
„	CONTRARIUS, MULL.	Tenasserim.
	<i>A. atricallus</i> , GOULD.	
„	JANUS, PFR.	Tenasserim (?).
	<i>A. atricallus</i> , <i>Conchologia Indica</i> , Pl. xix. f. 5 (not of Gould).	
„	PERCELLATUS, MOUSS.	Andamans.
„	LEPIDUS, GOULD.	Mergui Archipelago.
„	MONILIFERUS, GOULD.	Tavoy.
„	SCHOMBURGII, PFR.	
	<i>A. Andamanicus</i> , THORPE.	Andamans.
	<i>A. Theobaldianus</i> , B.	Tenasserim Valley.
	„ ( <i>sinistral race</i> ).	Thoungyeen Valley. Martaban.
„	SINENSIS, B.	Martaban. Pegu. Arakan.
	<i>A. Romieri</i> , PFR.	
„	SYLVESTICUS, B.	Arakan.
PEROXÆUS	NILIGRICUS, PFR.	Upper Salween Valley.

The occurrence of this shell in the Shan states, where it was procured by M. Fedden, is a remarkable fact.

„	VICARIUS, W. BL.	Upper Salween Valley.
---	------------------	-----------------------

## PUPINÆ.

CYLINDRUS	INSULARIS, EHR.	Upper Burma.
	<i>C. pullus</i> , GRAY.	
PUPA ( <i>Scopelophila</i> )	AVANICA, B.	Upper Burma.
„ ( <i>Scopelophila</i> )	FILOSA, STOL.	Arakan Coast (on trees).
„ ( <i>Scopelophila</i> )	SALWINIANA, THEOB.	Upper Salween Valley.
„ ( <i>Papisona</i> )	LIGNICOLA, STOL.	Maulmain.
„ ( <i>Leucachila</i> )	ELENOTICA, HUTTON.	Upper Burma.

HYPSELOSTOMA, *Benson*.

The type of these curious little shells with their uplifted trumpet shaped mouth was found by myself adhering to limestone rocks near Thayet-myo. In their habits they are just like pupas, and it is not improbable other species may be discovered.

„	BENSONIANUM, W. BL.	Myaditdoun, Ava.
„	DAYANUM, STOL.	Damathat Hill, Martaban.
„	TUMFERUM, B.	Tondoun Hill, Thayet-myo.

## SUCCININÆ.

SUCCINEA	ACUMINATA, W. BL.	Momein, Yunnan.
„	Plicata, W. BL.	Toungthap, Arakan.
„	SEMISERICA, GOULD.	Tavoy, Pegu.

## CLAUSILINÆ.

CLAUSILIA, *Draparnaud*.

Burma is rich in *Clausilias*, but more species doubtless will be discovered when the adjoining countries come to be investigated. *C. bulbos*, B., and *C. tuba*, Hanley, are remarkable forms of the genus.

„	ARAKANA, THEOB. and STOL.	Arakan Hills and Maii, Sandoway.
„	BULBUS, B.	Banks of the Attaran.
„	FUSIFORMIS, W. BL.	Arakan Hills.

CLAUSILIA GOULDIANA, Pfe.	Mergui, Maulmain, Salween Valley.
„ INSIGNIS, Gould.	Tavoy.
„ var.	Maulmain.
„ MASONI, Theob.	Hills East of Toung-ngoo.
„ OVATA, W. Blanford.	Nattoung on the Attaran R.
„ PLANGENSIS, Stol.	Penang.
„ var. (?)	Andamans.
„ PHILIPPANA, B.	Fern Caves, Maulmain.
„ TUBA, Hanley.	Upper Salween Valley.
„ THEOBALDI, W. Bl.	Toung-ngoo.
„ VESPA, Gould.	Tavoy.

STREPTAXINÆ.

ENNEA BICOLOR, Hutton.	Pegu, Tenasserim, Bhamo, Nicobars.
„ <i>P. mollita</i> , Gould.	

This little shell, and its constant companion *O. gracilis*, is found over the greater part of India, under stones.

„ FARTOIDEA, Theob.	Upper Salween Valley.
HUTTONELLA CYLINDRELLOIDEA, Stol.	Damathat caves.
STREPTAXIS ANDAMANICUS, B.	Andamans. Great Coco.
„ BURMANICUS, W. Bl.	Pegu. Toungloop. Toung-ngoo.
„ BLANFORDI, Theob.	Pegu.
„ BOMBAY, B.	Maulmain.
„ EXACTUS, Gould.	Maulmain. Mergui.
„ ELISA, Gould.	Mergui Archipelago.
„ HANLEYANUS, Stol.	Kwengan Hill.
„ OBFUSCUS, Stol.	Chouktalon Hill, Maulmain.
„ PLATTI, Gould.	Mergui.
„ SANKEYI, B.	Maulmain.
„ SOLIDULUS, Stol.	Maulmain. Ye-the-bian Hill.
„ THEOBALDI, B.	Bhamo.
„ PREIFFERI, Zelebor.	Nicobars. Kamorta. Katchall.

Sub-order *LYMNOPHILA*.

Family **Limnæidæ**.

Eyes sessile at the inner bases of the tentacles. Animal aquatic, but coming to the surface to breathe air. Respiratory opening on the right side. Excretory opening on the left. Shell thin, with the outer lip simple, acute, and the columella usually with an oblique fold.

LYMNÆA ACUMINATA, Lam.	India and Burma.
„ <i>L. amygdalus</i> , Tros.	
„ <i>L. chlamys</i> , B.	
„ <i>L. rufescens</i> , Gray.	
„ <i>L. rubiginosus</i> , Mich.	

A species as variable as it is widely spread.

„ LUTEOLA, Lam.	India and Burma.
„ PEREGRINA, Mull.	Yunan. Upper Salween Valley.
„ YUNANENSIS, Newcombe.	Sanda, in Yunan.
„ ANDERSONIANUS, Nevill.	Yunan and Upper Salween Valley.
„ <i>L. marginata</i> , Con. Ind. (not Michaud)	

PLANORBINÆ.

Shell depressed, spiral, many-whorled. Aperture crescentic.

**PLANORBIS, Guttard.**

Shell dextral. Foot small. Peristome thin. Tentacles long.

„	COMPRESSUS.	India. Yunnan.
„	EXUSUS, Desh.	India. Blaumo. Pegu. Tenasserim.
	<i>P. Indicus</i> , B.	
	<i>P. Coromandelianus</i> , Kust.	
	<i>P. Merguensis</i> , Phil.	
„	CONVEXICUTUS, Hutton.	Sanda in Yunnan.
„	CALATHUS, B.	Ava.

**Family Veronicellidæ.**

VERONICELLA BURMANORUM, Theob. Arakan. Pegu. Yunnan. Tenasserim.  
See J. A. S. B. 1873, Part II. p. 31.

**Family Onchidiidæ.**

ONCHIDIUM	PALLIDUM, Stol.	Pegu.
„	TIGRINUM, Stol.	Pegu.
„	TENERUM, Stol.	Pegu.

The species of *Onchidium* are estuarine slugs, abounding in muddy spots within the tidal area of large rivers. The type of the genus, *O. typha*, B. H., abounds in the Hugli at Calcutta. For full details of the anatomy, see Stoliczka, Jour. As. Soc. Bengal, 1869, Part II. p. 88.

**Family Auriculidæ.**

The animals of this family are mostly marine marsh residents, harbouring under stones and fallen trees, either in mangrove swamps actually between tide-marks, or in places occasionally inundated by salt water.

*Auricula* inhabits mangrove swamps and is quite at home in salt water. *Pythia* is found in moist spots near the sea, but not inundated by the tide, or only within its occasional reach.

*AURICULA	AURIS-JUDE, L.	Coast of Burma.
*	„ GANGETICA, B.	Irrawaddy Delta.
„	PUSILLA, H. et A. Adams.	Arakan Coast.
*CASSIDULA	AURIS-FELIS, Brug.	Coast of Burma.
*	„ NUCLEUS, Mart.	Coast of Burma.
„	LABRELLA, Desh.	Coast of Burma.
*PYTHIA	PLICATA, Fer.	Coast of Burma.
*	„ TRIGONA, Trosch.	Coast of Burma.
*	„ OVATA, Pfr.	Arakan Coast.
	PLECOTREMA CUMINGIANA, W. Bl.	Irrawaddy Delta.
*MELAMPES	FASCIATUS, Desh.	Coast of Burma.
	PERSA, H. et A. Adams.	
„	MELANOSTOMA, Gavi.	Coast of Burma.

**Sub-order THALASSOPHILA.**

Eyes sessile, on the front part of the frontal disk formed by the expanded tentacles.

**Family Amphibolidæ.**

Shell globose, umbilicated. Operculum horny, subspiral.

AMPULLARINA	BURMANA, W. Bl.	Irrawaddy Delta.
-------------	-----------------	------------------

*Family Siphonariidæ.*SIPHONARIA, *Blainville*.

Shell limpet-shaped, with a siphonal groove on the right side. Animal lives within reach of the tide on rocks, like limpets, but breathes air. Respiratory orifice closed by a large fleshy lobe of the mantle (Adams).

.. sp. One or more species common on the coast.

Sub-class *HETEROPODA*.

Animal oceanic, predatory, bisexual.

*Family Ianthinidæ.*IANTHINA, *Bolton*.

The 'violet snails' are furnished with a swimming 'raft' of cartilaginous airsacs, beneath which the ovarian capsules are arranged. This 'raft' is an extreme modification of the operculum of other genera. When molested, these animals exude a violet-coloured fluid (similar in colour to their shells), derived, it is thought, from the '*vellette*' and other acalephs whereon they feed.

## Class CEPHALOPODA.

Free oceanic mollusks. Sexes distinct. Reproduction by ova of comparatively large size. No metamorphosis.

Head distinct, furnished with limbs usually armed with pneumatic cups and sometimes claws, which are used both for locomotion and for securing their prey. Eyes well developed, and mouth furnished with a powerful parrot-like beak, capable of crushing crustacea and fish. Unisexual. There is also an oral tube or siphuncle from which water can be forcibly expelled, thereby causing the animal to dart swiftly in an opposite direction. "Their warfare," says Dr. Johnston, "though cruel is open. The long flexible arms that encircle the head are furnished with dozens of cup-like suckers often pointed with sharp recurved teeth. It must be a fearful thing for any living creature to come within their compass or within their leap; for captured by a sudden spring of several feet, made with the rapidity of lightning, and entangled in the slimy serpentine grasp of eight or ten arms, and held by the pressure of some hundreds of exhausted cups, escape is hopeless."

## Order POLYPODA.

Body inclosed in the last chamber of an external chambered siphuncled shell. Limbs numerous, tentacular, without cups. Gills four.

\*NAUTILUS POMPILIUS, L.

Dr. George Bennett gives the following description of the mode employed for capturing the pearly nautilus by the Fijians (Proc. Zool. Soc. Lond. 1859, p. 227):—"The Feejeans esteem the pearly nautilus highly as an agreeable viand, and their mode of capturing it, for the embers or for the pot, is not a little interesting. When the water is smooth, so that the bottom, at several fathoms of depth, near the border of the reef, may be distinctly seen, the fisherman, in his little frail canoe, scrutinizes the sand, and the coral masses below to discover the animal in its favourite haunts. The experienced eye of the native may probably encounter it in its usual position, clinging to some prominent ledge, with the shell turned downwards, and preparations are accordingly made for its capture. The tackle consists, first, of a large round wickerwork basket, shaped very much like a cage rat-trap, having an opening above, with a circle of points directed inwards, so as to permit of entry but preclude escape; secondly, a rough piece of native rope of sufficient length to reach the bottom; and, thirdly, a small piece of branched wood, with the branches sharpened

to form a sort of grapnel, to which a perforated dome is attached, answering the purpose of a sinker. The basket is now weighted with stones, well baited with boiled crayfish (*Palinurus*), suggested no doubt by the large quantity of the fragments of crustacea usually to be found in the crop of the Nautilus, and then dropped gently down near the victim. The trap is now either closely watched, or a mark is placed upon the spot, and the fisherman pursues his avocations on other parts of the reef until a certain period has elapsed, when he returns and in all probability finds the Nautilus in his cage feeding on the bait."

The shells of Cephalopoda are either internal, like *Spirula* and *Belemnites*, or external, like *Nautilus* and *Ammonites*. They may be either straight, like *Orthoceras*, involute, like *Spirula*, or revolute, like *Nautilus* and *Ammonites*. The term *involute*, or 'curled under the belly,' and *revolute*, or 'curved over the back,' are used with reference to the back and belly of the animal. On this subject great misapprehension has universally prevailed, and the terms 'ventral' or 'dorsal' have been applied to the *shell* without regard to the position it held *quoad* the ventral and dorsal aspects of the animal. A masterly paper by Professor Owen (in Proc. Zool. Soc. Lond. 1878, p. 955) clearly shows how erroneous the popular nomenclature is, and the following passage defines the true sense in which the terms *dorsal* and *ventral* should be used in respect to the Cephalopoda:—The dorsal aspect of a Cephalopod is determined by the position of the brain and eyes, *i.e.* by that predominating part of the brain which sends off the optic nerves. The ventral aspect is shown by the respiratory funnel. No malacologist has questioned these conclusions. The proposition might be simplified by stating that the funnel shows the 'ventral side' of the animal, and that the opposite one is the 'dorsal side.' To give a familiar application of this mode of viewing the shell of a Cephalopod, we have only to imagine a dog's tail as representing the curled siphuncle of the shell. In a terrified condition of mind, its tail will be coiled under its belly, or involutely, and will then represent the curve of the *Spirula*, *quoad* the position of the animal; but when in a joyous frame of mind, its tail will be curled jauntily over its back, or '*revolutely*,' as is the curve of *Nautilus* as regards the animal which formed the shell. This explains a seeming anomaly thus described by Owen (*l.c.*): "Accordingly, all who have occupied themselves with the organization of the Cephalopods have pointed out the singular reversed positions of the mandibles, as compared with those in such vertebrate animals as repeat the cephalopodic condition of a 'beak,' as e.g. *Chelonia* and *Aves*. Instead of the dorsal, or upper mandible, being the largest and longest, so as to overlap the ventral, or under mandible, as in birds, the dorsal mandible is the smaller and shorter, and is underlapped by the larger and longer ventral mandible in all Cephalopods." Of course the real state of the case is, that the beaks of a Cephalopod are really precisely homologous to those of a hawk, the upper, or dorsal, overlapping the lower, or ventral, but these terms having been erroneously applied to the shell, the 'beaks' of the Cephalopod have seemingly (but not truly) displayed the above curious deviation. It is therefore an error to use the terms '*dorsal*' and '*ventral*' as synonymous with '*external*' and '*internal*,' as is so generally done. Of course, in all coiled shells, the convexity is external, and the concavity internal, and there is no objection to applying these terms to the *shell*; but when we speak of *ventral* and *dorsal*, we must then have regard to the animal, and discrimination is then imperative, whether the shell is dorsally revolute, or ventrally involute, our sole guide being, of course, the relation of the shell to the ventral and dorsal aspect of the animal.

#### Order DECAPODA.

Limbs (arms) ten. An internal shell. Two of the arms are elongated and fitted with pedunculated cups. The decapods are divided into *Chondrophora* with an internal horny pen; *Sepiophora* with a calcareous bone; and *Belemnophora* with an internal chambered shell. The size to which some members of this order grow may be gathered from the size of an *Architeuthis princeps*, Packard, which was encountered by some fishermen in Conception Bay, Newfoundland, and which is

described, together with sundry other new and rare Cephalopoda, by Prof. Owen, in the Transactions of the Zoological Society of London, vol. xi. p. 161, from which I shall quote a few particulars. "A few weeks ago" (December, 1873) "two fishermen lying off St. John's observed an object floating in the water which they took to be a portion of a wreck. On reaching it, one of the men struck it with a boat-hook, whereupon the supposed piece of wreck became alarmingly lively, 'rearing a parrot-like beak, as big as a six-gallon keg, with which it smote the boat. Next it shot out from its head two huge livid arms, and began to twine them about the boat.' Happily an axe lay handy, and with it the boatman, recovering from the surprise into which this unexpected attack had thrown himself and his mate, cut off both the arms as they lay over the gunwale, whereupon the fish backed off and ejected an immense quantity of inky fluid that darkened the water for a great distance about." This account of the Rev. M. Harvey of St. John's was accompanied by photographs of the portions of the monster thus obtained. The length of the arm cut off was 19 feet and the entire length was estimated at 39 feet. That this is not an extravagant estimate is rendered probable by the size of Squid captured in Coomb's Cove, Fortune Bay, in 1872, and measured by the Hon. T. R. Bennett, of English Harbour, Newfoundland. The length of the body, arm and tentacle of which was respectively 10, 6, and 42 feet; and of another of these monsters taken in Trinity Bay, 9½, 11 and 30 feet. Another remarkable animal was stranded by a tidal wave in November, 1874, in the Isle of St. Paul, during the residence there of the party of astronomers waiting to observe the 'Transit of Venus,' and this monster was photographed as it lay on the rocks by the artist attached to the expedition. This animal measured over 30 feet, and seems to belong to a different genus from the Newfoundland animal, and which M. Vélain proposes to name *Mouchezis* after Capt. Mouchez, commandant of the expedition.

a. *Chondrophora*.

Family **Loliginidæ**.

To this family belongs the common 'squid,' so valued as a bait for the Cod fishery of Europe. The species of this and other allied families on the coast of Burma have not been ascertained.

b. *Sepiophora*.

Family **Sepiidæ**.

Shell cellular, calcareous.

SEPIA, sp. *Pliny*.

A species on the coast is known as 'ye-jiet,' or 'water-hen,' by the Burmese.

c. *Belemnophora*.

Family **Spirulidæ**.

SPIRULA, *Lamarck*.

Shell internal, spiral, chambered and siphuncled.

\* „ PERONII, *Lam.*

Order OCTOPODA.

Limbs (arms) eight. No internal shell.

Family **Octopodidæ**.

Arms subulate. An 'ink bag' present, with which they render the water turbid when alarmed and under cover of which they retreat.

\*CISTOPS INDICTS, *Rupp.*

'Ye-myouk.' Water monkey of the Burmese.

This species is very common on the Arakan coast, and is sought for as food by the Burmese in the pools left by the tide. The retreat of the animal is indicated by a small hole in the sand or gravel, with a few relics, in the shape of fragments of crabs, scattered around. A crushed crab is used as a bait, firmly bound round with string, the ends of which are wound round the fisherman's left wrist. The bait is held in front of the hole and is soon perceived by the animal in ambush, who protrudes some of its arms and endeavours to drag the crab into the hole; this the fisherman prevents by firmly planting his knuckles in the sand, and the *Cistopus* in a little time emerges from his retreat and fastens on the crab. With his right hand the fisherman now drives a sharp spike of bamboo through the animal's body and secures it.

### Family **Argonautidæ.**

*ARGONAUTA, Linnaeus.*

Males smaller than the females. Females secrete a symmetrical shell for the protection of the ova, and which has no muscular attachment to the soft parts of the animal. The argonaut swims swiftly in a reversed position with the 'shell' firmly clasped by the arms.

„ OWEN, Adams and Reeve.

The Cephalopoda are not only interesting as being the most highly endowed of all invertebrates, but as comprising the only species of that class of creatures which by their size and strength are capable of proving formidable to man and the higher animals. It is true, that as a rule the large Cephalopods, of whose dimensions and powers we have only lately acquired anything like a precise knowledge, are fortunately rare, and do not evince any disposition to molest mankind; but their ability to rival the shark in destructiveness is undoubted, did their numbers or habits force them obtrusively on our notice. At the present day, however, they are of service, rather than otherwise, to mankind, and a European species, common in the Mediterranean, yields the valuable pigment sepia, whilst almost any species will serve as a most attractive bait, and some species are habitually sought for and so used by fishermen. In the East, moreover, dried cuttle fish are much esteemed as food, and can be bought in Rangoon or any large bazaar in China, and I have little doubt, that were the delicacy introduced into England it would be duly appreciated, and that, 'soused cuttle fish' or 'kippered squid' would prove an acceptable addition to the breakfast-table.



## Sub-Kingdom VII. VERTEBRATA.

Red-blooded animals, with the mass of the nervous centres inclosed in a bony axis. Sexes distinct. Jaws invariably above and below, never lateral. The muscles always external to the bones.

## ICHTHYOLOGY.

**R**EGARDING Fish in the light of a food supply for the masses, there is, perhaps, no part of the East where this item forms so important a feature of the national dietary as in Burma, which mainly arises, of course, from the Buddhist faith, which indisposes the people to the use of butcher's meat, which is replaced by Ngā-pī, or the fish paste so universally used as a condiment with rice by all classes of society in Burma. This being so, the following remarks will not be regarded out of place, taken from Dr. Day's Report on 'Freshwater Fish and Fisheries of India and Burma,' p. 15:—"The fishes, which are chiefly useful as food in the fresh-waters of India, belong to the order *Physostomi*, especially in its Siluroid, Cyprinoid, and Herring families; as well as those which are included in the order *Acanthopterygii*, subdivided by some authors into two. The other orders which furnish examples to the fresh waters are only employed as food by the very poorest classes, or even entirely rejected.

In the sub-class TELEOSTEI, the spiny-rayed or ACANTHOPTERYGIAN orders of fishes are not found in any great numbers in the inland fresh waters of India, but are mostly confined to the plains, either within, or but a short distance removed from tidal reach, or above the sea-level. The larger the river, the greater the probability of these fishes extending their range up it. There are some genera which possess species that are able to exist some time after their removal from the water, and even to dive down and remain in the mud of tanks during the dry season, re-appearing with the returning rains. These hard-rayed fishes, which are taken in the fresh waters, mostly belong to the following 18 genera, some of which are marine, others not so:—1 *Lates*, 2 *Ambassis*, 3, *Corrina*, 4 *Mugil*, 5 *Equula*, 6, *Gobius*, 7 *Euctenogobius*, 8 *Periophthalmus*, 9 *Eletotris*, 10 *Badis*, 11 *Nandus*, 12 *Catopra*, 13 *Anabas*, 14 *Polyacanthus*, 15 *Trichogaster*, 16 *Ophiocephalus*, 17 *Rhyuchobdella*, 18 *Mastacembelus*.

The foregoing 18 genera are divisible into two distinct classes; *first*, those which entirely belong to the fresh waters. *Secondly*, those which are marine, and only ascend rivers for predaceous or breeding purposes. Of the true fresh-water ones the first four are monogamous—*Anabas Thomassi*, *Polyacanthus eupanus*, *Trichogaster fasciatus*, and *Ophiocephalus gachua*, and perhaps also *Gobius giuris* and *Euctenogobius striatus*, all of which appear peculiarly adapted for tanks and 'engs,' as they live in the grass along their edges, where the larger varieties lie in wait for frogs, or other animals, whereon they prey, whilst the four first named genera,

being air-breathers, have only to raise their mouths out of water to take in their modicum of air.

Others of these genera, as *Ambassis* (sp.), *Badis*, *Nandus*, *Catopra*, *Rhynchobdella* and *Mastacembelus*, are apparently polygamous.

Of the whole of these *Acanthopterygians*, but few are generally distributed through the inland tanks far from the sea-level, or beds of large rivers; these exceptions are the little *Ambassis*, a goby, *Gobius giuris*, the small *Badis*, the percoid *Nandus*, the 'walking fishes' *Ophicephalus*, and the spined eels, *Rhynchobdella* and *Mastacembelus*.

Of the second, or marine division, of this order of fishes, some, as *Lates calcarifer*, *Corrina coitor*, and *Equula*, though marine, ascend rivers at certain seasons to obtain food, sometimes going long distances up their course; thus I have taken *L. calcarifer* at Mandalay, about 650 miles from the sea, evidently following the shoals of *Clupea palasah* for prodaceous purposes.

Fishes of the order *Ihyostomi*, or those in which the air-vessel communicates with the pharynx by means of a pneumatic duct, contain the largest proportion of the Indian fresh-water fishes. One of these families (*Siluridae*) is destitute of scales, whilst they are present in the *Coprinidae*, which have no teeth in the jaws or palate, and also in the herrings (*Clupeidae*), the majority of which have a trenchant abdomen (as the hilsa, *Clupea palasah*), or generally a few minute teeth in the jaws or palate. The *Notopteridae*, which also belong to this order, furnish some species which are esteemed by the natives.

The Siluroid family *Siluridae* are commonly known as Cat-fishes, because they generally possess a number of long barbels arranged around the mouth. These fishes mostly prefer muddy to clear water, as such conceals their presence. The more developed and numerous these barbels, the better adapted these fish seem to be for an inland and muddy fresh-water residence, whilst, on the contrary, those which are strictly marine do not appear to be so well furnished with these appendages. Siluroid fishes are also generally armed with strong spines in the fin of the back, and the pectoral fins, and which as a rule are serrated: with these, severe wounds are often inflicted, which renders the handling of them dangerous. The Siluroid fishes which are captured in the fresh waters mostly belong to the following 25 genera, excluding *Chaca*, some of which are marine:—1 *Akysis*, 2 *Erethistes*, 3 *Macrones*, 4 *Rita*, 5 *Arius*, 6 *Pangasius*, 7 *Pseudentropius*, 8 *Callichrous*, 9 *Wallago*, 10 *Olyra*, 11 *Silurus*, 12 *Clarias*, 13 *Saccobranchus*, 14 *Siluridia*, 15 *Ailia*, 16 *Aillichthys*, 17 *Eutropiichthys*, 18 *Sisor*, 19 *Gagata*, 20 *Hemipimelodus*, 21 *Bagarius*, 22 *Pseudocheneis*, 23 *Glyptosternum*, 24 *Amblyceps* and 25 *Exostoma*. Of these the following eighteen are wholly resident in the plains and do not extend into the hills, and of these the first eight have the air-vessel free in the abdominal cavity and not inclosed in bone, *Erethistes*, *Rita*, *Arius*, *Pangasius*, *Pseudentropius*, *Callichrous* and *Wallago*, whilst the next ten have it more or less inclosed, *Clarias*, *Saccobranchus*, *Siluridia*, *Ailia*, *Aillichthys*, *Eutropiichthys*, *Sisor*, *Gagata*, *Hemipimelodus* and *Bagarius*. Three genera, extending from the plains into the hills (destitute of Alpine sources), possess an air-vessel lying free in the abdominal cavity, *Akysis*, *Olyra* and *Silurus*; whilst four genera, extending into the hills (with or without Alpine sources), possess an inclosed air-vessel, and the first two are moreover furnished with a thoracic adhesive apparatus, *Pseudocheneis*, *Glyptosternum*, *Amblyceps* and *Exostoma*.

From the foregoing observations it appears that the majority of the genera of Indian fresh-water Siluroids have their air-vessel inclosed in bone, whilst it is not so inclosed in any of the marine forms; that among the Siluroids of hilly regions, those which ascend rivers having Alpine sources have the air-vessel inclosed in bone, whilst those which ascend rivers not snow-fed do not appear of necessity to have their air-vessel thus protected."

These observations of Dr. Day are of great interest, but for fuller particulars reference must be made to his admirable reports. The following observations are, however, condensed from his chapter on the 'respiration of fishes.' Fishes may, as regards their respiration, be divided into water-breathers and air-breathers, the former never requiring direct access to the air; the latter rapidly dying of suffocation if denied it. In

the water-breathers, as the carps, and the majority of fish in general, respiration is effected by means of the gills, the aeration of the blood being effected in them by contact with the air held in suspension in the water, whence the well-known necessity of constantly changing the water wherein fish are kept, and any obstruction to the free action of the gills, as a landage over them, or an excess of mud suddenly added (as during freshes) or noxious solutions, rapidly induces asphyxia, and the fishes die suffocated. Air-breathers, on the contrary, do not seem to be much inconvenienced by their gills being closed, if they are allowed to come to the surface and inspire air directly by their mouths, but, on the contrary, soon die of suffocation, though their gills are left free to act, unless they are also allowed access to the air as well. Among these air-breathers are the *Anabas scandens*, or climbing perch, and the species of the Acanthopterygian genera *Polyacanthus*, *Trichogaster*, and *Ophiocephalus*, all of which possess a cavity above the gills (analogous to the lung chamber in some mollusks) for the reception and storing of air for respiratory purposes. "In Burma," says Dr. Day, "the fishermen appear to be practically acquainted with the fact of some fish, especially *Ophiocephalidae*, being air-breathers, as they are in the habit of removing the water from a tank and covering the mud with a cloth for two or three days, after which the cloth is removed and the dead or half-suffocated fish picked up out of the mud."

The shape and modifications of the air-vessel afford a most interesting subject for study, whether it is free, or encased wholly or partially in bone, and a series of preparations of this organ, showing its varied form, would be equally valuable and interesting, and one by no means difficult in a country like Burma to make. Of accessory breathing organs Dr. Day thus writes, "In some of the siluroids there exists an accessory breathing apparatus; thus the *Clarias* possesses a dendritic one on the convex side of the second and fourth branchiæ, which has much the appearance of a bunch of red stick coral; this is received into a cavity posterior to that existing solely for the gills. In the *Saccobranchus*, or scorpion-fish, a long air-vessel of a pulmonic character (in addition to the air-vessel proper, which is inclosed in bone) extends throughout the length of the muscles of the back, and anteriorly opens into the gill-cavity.

In the eel-like *Synbranchidæ*, the *Amphipnois cuchia* has a pulmonic sac for the reception of air, connected with the gill-cavity."

These curious contrivances, so wholly unknown to most people, go far to explain the sudden appearance of fish after rain, in dried-up ponds, as air-breathing fish, as the water dries up, bury themselves in the mud and aestivate in a torpid condition beneath the hard surface crust, and in India fish are often thus dug up by villagers from the dried-up beds of tanks. This probably is the most common cause for the anomalous appearance of fish after rain; but there are two others. Some fish, as the *Anabas scandens* and some eels, and perhaps more fish than we are aware of, will travel over damp grass or through moist ditches, during the night, from one piece of water to another, or in search of a more suitable residence, and may in doing so be surprised by daylight in queer places. On this migratory instinct Dr. Day observes (*l.c.* 30). "This migratory propensity of some of the fishes of the East was no secret to the ancient Greeks, who frequently commented upon it, and although the truth of their statements was impugned by the Romans, the accuracy of their facts is above dispute." Lastly, real showers of fish too may be actually produced by a whirlwind or waterspout, sucking up the contents of a pond or stream, and distributing it broadcast in some distant spot.

In the last edition of this work, Dr. Mason enumerated the following fish, viz.: Large scaled fish 30, small scaled 15, carp 45, flat fish, herrings and eel fish 51, cartilaginous fish 9, tortoise fish 4, and eels 9—in all 163 species. The present list, compiled from that splendid contribution to our knowledge of this subject, Dr. Day's 'Fishes of India,' embraces over 170 species. But even this large addition to the fishes of Burma is far from exhaustive, as the great majority of fish from the Eastern seas are unquestionably found on the coast, but I have extracted few from Dr. Day's work save those which are stated in it or in his Reports to have been captured in Burmese waters.

The following fish are enumerated by Dr. Mason as producing isinglass in Burma: *Lates calcarifer*, *Sciaena coitor*, *S. diacanthus*, *S. miles*, *Sciaenoides bauritus* and *Polynemus Indicus*; but the following remarks, extracted from Dr. Day's reports, will show that the above by no means comprise all the fishes in Burma capable of producing that substance. Isinglass is produced by fish of two distinct orders, the best being furnished by the *Acanthopterygian* families *Percidæ* and *Polynemidæ*, and an inferior product by the *Physostomous Siluridæ*. Of the seven recognized species of *Polynemus*, only two produce isinglass, and they are distinguished from the others by possessing five pectoral appendages. Other *Acanthopterygian* fishes producing isinglass are *Sciaena arillaris*, several species of *Serranus* and *Otolithus* and *Sciaenoides pama*. The air-vessels of the siluroid cat fish, which yield an inferior isinglass, are entirely different from the last. They are like short rounded bags, with an open mouth, thus being where they have been torn away from their adhesions to the vertebrae. Chief among these fish is the *Rita ritoides*, C. and V., or *Pimelodus rita*, Ham. Buch., which attains a large size and is found far up rivers. Other fish yield similar 'sounds' belonging to the genera *Arius*, *Osteogobius* and *Macropodus*.

The great thing to be observed in the preparation of isinglass is the complete purification and separation, whilst fresh, of the silvery membrane of the air-vessel from its muscular attachments and all blood and mucus, and the rapid drying of the same in the air. Any neglect in this first process causes a fishy flavour to be perceptible in the product, which seriously reduces its value, and cannot be subsequently got rid of.

Another important product that may be here noticed is fish oil, either of a common sort, adapted for various industrial uses, or of a pure quality for medicinal use. This pure oil, which passes for 'cod liver oil,' is prepared from the livers of Chondropterygians or cartilaginous fish, as sharks and saw-fish. The larger the liver the greater proportion of oil it yields, small ones giving one-third and large ones one-half their weight of oil. Dr. Day records one liver of a shark which weighed 290 lbs., and another of a saw-fish of 185 lbs. weight. To prepare the best oil, fit for medicinal purposes, the livers are cut into pieces of 4 lbs. each, placed in pots with enough water to cover them to  $1\frac{1}{2}$  inch and gradually heated to 130°. It is now stirred, and any froth skimmed off, and the vessel placed to cool. The oil which collects on the surface is now removed, and subjected to repeated strainings through long cloth and flannel. The oil should have no deposit, be of a light clear straw colour, and an odour resembling pure cod-liver oil.

The following observations on the wholesomeness of Indian fish are condensed from Dr. Day's Report. The great majority of fish, both marine and fresh water, may be regarded as wholesome, though there is great difference in fish as regards flavour, and the abundance or paucity of bones contained in them. Some marine fish are occasionally poisonous, as *Clupea venenosa* of the Seychelles, and *Clupea thrissa* of the West Indies. *Clupea humeralis*, at the Antilles, is so poisonous (from feeding on *Physalia*, as it is thought), that it is said to have occasioned death in a few minutes, and even the common herring (*Clupea harengus*), such a sweet and excellent fish ordinarily, is occasionally very irritating when eaten in the North Sea, after it has fed on some minute red worm, which is at times very abundant there. Some fresh-water fish, especially the smaller vegetable feeders among the *Cyprinidæ*, are liable to cause visceral derangements, especially those species found in hill streams, and particularly so with strangers, the same fish being eaten with impunity (from habitude probably) by residents. I myself once had a violent attack of English cholera (being at the time in perfect health), brought on by making a hearty breakfast off some small fish in the Kangra Hills, and I perceived nothing wrong with the fish whilst eating them.

Speaking of a mountain barbel, *Oreinus sinuatus*, commonly eaten in Chumba, by both Europeans and natives, Dr. Day remarks: "One of my native servants, who tried one, declined a second attempt, as he was unwell for 24 hours subsequently"; and in some of the Punjab rivers similar deleterious effects have been recorded. Some people, too, are constitutionally unable to eat fish, through some idiosyncrasy, without any reference to the excellence of the fish, and I know an instance of a

lady (no other than the "placens uxor" of the writer) who is very fond of fish, and could once eat it, but can do so no longer without being made violently ill by it. Occasionally it happens, too, that a perfectly wholesome fish may, from the nature of what it has lately fed on, be rendered temporarily unwholesome. Thus many 'scari,' or parrot fishes, are held to be unwholesome at Mauritius between December and April, from it is supposed their feeding on the coral polypes; and fishes which have fed on poisonous or stinging medusæ are supposed to be rendered poisonous by so doing. To come nearer home, some fish are eaten by the Andamanese which are regarded as poisonous in Burma. A more remediable cause of unwholesomeness, however, in fresh-water fish, is where they have access to the filth of towns and have gorged themselves at the outfall of a latrine. This, however, is a palpable source of contamination, and is alluded to by Juvenal in his Fifth Satire, where he contrasts the fish the wealthy host himself eats with that set before his poor retainers—

"Vos anguilla manet, longæ cognata colubæ  
Aut glaciæ adpersus maculis Tiberinus, et ipse  
Vernula riparum, pinguis torrente cloaca,  
Et solitus medicæ cryptam penetrare suburæ."

In like manner there is a wonderful difference in the quality of the flesh of the same species of fish, depending on whether it has been taken from a clear running stream, or a muddy and sluggish one. Season also has great influence on the wholesomeness of fish, as, after spawning, many fish are out of condition, and more or less unwholesome, and the roe of some species (as the English barbel) is apt to violently disagree with some stomachs, a circumstance humorously alluded to by old authors. Some fish seem to become unwholesome with age, though the young are not so, as the *Caranx fallax*, or horse mackerel, which in some places it is illegal to sell for food if more than 2½ lbs. in weight.

As a rule, therefore, it may be held that the most wholesome fish may become deleterious or actually poisonous, if caught soon after having fed on foul or deleterious substances, and with this proviso all the fishes belonging to the carp and cat-fish families (*Cyprinidæ* and *Siluridæ*) are good for food, and of these the Mahseer is perhaps our finest fresh-water fish for the table. Of marine fish, those ornamented with gaudy colours are to be distrusted, as the Parrot fish, *Scari* and *Balistes*, and at Bourbon and Mauritius *Ostracion cornutum* and *Balistes betula* are regarded as highly poisonous. The *Tetradons* or puff fishes, so called from inflating themselves with air, when captured, are usually considered poisonous, but according to Dr. Day are eaten and relished by the Andamanese. At the Cape of Good Hope, however, a spotted *Chatodon* has caused so many deaths that warnings are issued to ships regarding its use. In Japan a species of this genus is made use of to effect suicide. In Burma, however, the large yellow *Xenopterus naritus* is caught for food and considered good eating. All cartilaginous fish, as sharks, skates and saw-fish, are considered wholesome food, and their fins even rank in China as delicacies. The Torpedo, however, is an exception, and would seem not to be eaten.

All the herrings or *Clupeidæ*, would seem to be good for food, with the exceptions above noted. The hilsa, *Clupea palasah*, which ascends the large rivers of India to spawn, is one of the richest and most esteemed fish, but in Burma it is avoided by sick people and its use is supposed (erroneously no doubt) to induce or aggravate skin diseases. I think this dislike of the hilsa may originate from a prejudice the Burmese have against the smell of heated oil or grease, which they suppose produces fever. Any one therefore who wishes to fry any rich dish, takes it outside the village, that the fumes of the simmering oil may not cause illness to her neighbours. A rich oily fish like the hilsa could not be broiled without giving out such fumes, and hence it probably comes to be considered unwholesome.

All eels, *Muramidæ*, are wholesome, but the appearance of many is repulsive, and being ostensibly devoid of scales neither Jews nor Mahomedans will eat them.

As regards the effect of a fish diet on the health, and especially as tending to produce leprosy and skin diseases, Dr. Day pertinently remarks that leprosy is

unknown among the Burmese, who are large consumers of fish, both fresh, and in the form of tainted fish-paste, neither is it known among the ichthyophagous Andamanese, whereas in India it is equally common among both the classes who do and those who do not eat fish. The wounds inflicted by the spines of various sorts, with which many fish are armed, are usually angry and painful; but this is mainly due to their jagged character, though in some degree perhaps intensified by the mucous with which they are covered. In one instance, however, a veritable poison organ exists in a fish from Guatemala, *Thalassophryne reticulata*, a sort of 'lump fish,' which is armed with a hollow fin spine (analogous to the poison fang of serpents), from which a poisonous mucus is on pressure ejected.

### Class PISCES.

Vertebrata with extremities modified into fins, and which breathe by means of gills, sometimes supplemented by a pulmonary air-sac. Vertebrae biconcave.

#### Sub-class TELEOSTEI or ELEUTHEROBRANCHII.

Skeleton osseous. A long gill cover, or opercle, protecting a unilocular gill opening.

#### Order ACANTHOPTERYGII.

##### Family Percidæ.

Branchiostegals 7. Pseudobranchiæ present. Anterior portion of the dorsal fin spinous.

LATES, *Cuvier et Valenciennes*.

Preorbital and shoulder bone serrated. Teeth villiform on jaws, vomer, and palatine bones. Tongue smooth. Two dorsal fins united at their bases, the first with 7 or 8 spines, the anal with 3. Caudal rounded.

L. CALCARIFER, Bloch.

*L. heptadactylus*.

The 'Cockup,' or 'Bekti.' Ka-ka-dit (juv.), Ka-tha-boung (adult).

B. vii.; D. 7-8  $\frac{1}{11}$   $\frac{1}{12}$ ; P. 17; V.  $\frac{3}{5}$ ; A.  $\frac{3}{8}$   $\frac{3}{9}$ ; C. 17; Ltr. 6- $\frac{7}{12}$ .

Colour grey, with a dash of green along the back, and silvery below. During the monsoon it is tinged purplish.

The air-vessel is thin, but yields a good isinglass. It is excellent eating when caught away from the vicinity of large rivers. It salts well, and from it some of the best "tamarind fish" is prepared.

Inhabits the sea, estuaries, and tidal rivers, and Mason says it ascends the Irrawaddy 120 miles.

CROMILEPTES, *Swainson*.

Branchiostegals 7. Pseudobranchiæ. Preopercle with its vertical limb finely serrated, its horizontal one entire. Teeth fine, in jaws, vomer and palatæ. Dorsal fin elevated, with 10 or 11 spines. Anal with 3. Caudal rounded.

C. ALTIVELIS, Swain.

B. vii.; D.  $\frac{1}{8}$   $\frac{1}{12}$ ; P. 18; V.  $\frac{3}{5}$ ; A.  $\frac{3}{9}$   $\frac{3}{10}$ ; C. 17.

Scales cycloid, about 22 rows between the base of the sixth dorsal spine and the lateral line.

Colour greyish, lighter below, covered with round white-edged black spots, larger on the body, dorsal and caudal fins.

The Nicobars.

*SERRANUS, Cuvier.*

Branchiostegals 7. Pseudobranchiæ. Preopercle with its vertical limb more or less serrated, its horizontal one generally entire. Dorsal fin single, with 8 to 12 spines. Anal with 3. Caudal square or rounded.

The flesh of the *Serranî* is good, but coarse in large fish. They yield a small amount of isinglass.

*S. MERRA*, Bloch.

B. vii.; D.  $\frac{1}{16} \frac{1}{17}$ ; P. 18; V.  $\frac{1}{5}$ ; A.  $\frac{3}{8}$ ; C. 17.

Preopercle rounded, its vertical border coarsely but evenly serrated. Small canine teeth in both jaws. The outer row of teeth in the maxilla and inner in mandible, slightly larger than the rest. Dorsal spines rather strong, the fourth the highest.

Colour reddish brown, covered with large brown spots, save on the pectoral fins. Markings usually hexagonal with pale interspace. A dark semilunar mark over base of pectoral.

The Andamans, etc.

*S. HEXAGONOTUS*, Forster.

B. vii.; D.  $\frac{1}{15} \frac{1}{17}$ ; P. 16; V.  $\frac{1}{5}$ ; A.  $\frac{3}{8}$ ; C. 17.

Vertical limb of preopercle finely serrated for its upper two-thirds, more coarsely below.

Upper canines stronger than lower. Other teeth as in *S. merra*. Dorsal spines moderate, the fourth longest.

Colour reddish brown, with a pale hexagonal reticulation.

The Andamans.

*S. MACULATUS*, Bloch.

B. vii.; D.  $\frac{1}{17} \frac{1}{18}$ ; P. 18; V.  $\frac{1}{5}$ ; A.  $\frac{3}{8}$ ; C. 17.

Preopercle strongly and evenly serrated on its vertical border, its angle produced and carries 7 or 8 coarse denticles.

Small canines above and below. Other teeth as in *S. merra*.

Colour deep grey, with distant round black spots on the head, pectoral and ventral fins, and vertical oval ones on the body, becoming linear behind. Dorsal and caudal black edged.

The Andamans.

*S. FLAVO-CERULEUS*, Lacép.

B. vii.; D.  $\frac{1}{17} \frac{1}{17}$ ; P. 17; V.  $\frac{1}{5}$ ; A.  $\frac{3}{8}$ ; C. 17.

Preopercle finely serrated, save at the angle, where it is almost spinate. Teeth as in *S. maculatus*. Dorsal spines strong, third longest.

Colour of head and body a deep purplish blue. Fins and tail yellow, and some yellow on snout, maxilla, chest, and opercular spines. Ventral and caudal with fine black tips.

The Andamans.

This is a lovely and scarce fish, likened by Jerdon to a living sapphire.

*S. FASCIATUS*, Fork.

B. vii.; D.  $\frac{1}{15} \frac{1}{17}$ ; P. 18; V.  $\frac{1}{5}$ ; A.  $\frac{3}{8}$ ; C. 17.

Preopercle strongly serrated on its vertical border, coarser at the angle, above which it is emarginate. Canines in both jaws, and other teeth as in *S. merra*. Colour reddish, or yellowish, with 5 dark vertical bands, and a fine black edge along the dorsal fin.

The Andamans.

*S. TEMILABRIS*, Cuv. et Val.

*S. summana*, Cuv. et Val. (*nec* Fork).

*S. Hoerevii*, Blecker.

B. vii.; D.  $\frac{1}{15}$ ; P. 17; V.  $\frac{1}{5}$ ; A.  $\frac{3}{8}$ ; C. 19.

Vertical limb of preopercle slightly emarginate, angle rounded; the whole finely serrated, more coarsely so at the angle. Canines in both jaws, the teeth of the outer row in the maxilla, and the inner in the mandible, rather larger than in the villiform bands. Dorsal spines equal beyond the third. Caudal rounded. Colour, greyish olive, darker on the back. Body and head covered with unequal pearly-white spots. A black line on the maxilla. Fins blackish, white bordered. The dorsal white spotted.

Coast of Burma.

*S. MALABARICUS*, Bloch.

*S. Bontoo*, Cuv. et Val.

Nga-touk-tu. Arakan.

B. vii.; D.  $\frac{11}{16}$ — $\frac{17}{17}$ ; P. 19; V.  $\frac{1}{3}$ ; A.  $\frac{3}{8}$ ; C. 15.

Vertical limb of preopercle slightly emarginate, finely serrated, but more coarsely at its rather square angle, where there are from 4 to 7 coarse denticles. One or two canines in either jaw, the upper usually largest, the rest as in *S. merri*. Colour brownish, fading to grey or dirty white on the belly, wholly covered during life with yellow or orange spots, and sometimes five vertical bands as well.

Russell records one taken at Vizagapatam in January, 1786, as having measured 7 feet in length, 5 in girth, and which weighed upwards of 300 pounds.

*S. SALMOIDES*, Lacép.

B. vii.; D.  $\frac{11}{15}$ — $\frac{16}{16}$ ; P. 18; V.  $\frac{1}{3}$ ; A.  $\frac{3}{8}$ ; C. 17.

Preopercle with its vertical margin serrated, lower limb entire, and 5 or 6 denticles at the angle. Small canines in both jaws, the rest as in *S. merri*. Colour dark reddish brown, black spotted over head, fins, and body, with some ill-defined bands on body.

The Andamans.

*S. SUMMANA*, Forsk.

B. vii.; D.  $\frac{11}{15}$ — $\frac{16}{16}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{3}{8}$ ; C. 17; Lr.  $\frac{1}{9}$ — $\frac{2}{9}$ .

Preopercle with a shallow emargination above its angle, its vertical border finely serrated, its lower entire. Third to fifth dorsal spines longer than the others. Moderate canines in both jaws, the rest as in *S. merri*. Colour brownish, the body and vertical fins covered with small round white dots, and a black spot over the maxillary.

Common at the Andamans.

*S. FUSCIGUTTATUS*, Forsk.

*S. dispar*, Playfair.

B. vii.; D.  $\frac{11}{14}$ — $\frac{16}{16}$ ; P. 19; V.  $\frac{1}{3}$ ; A.  $\frac{3}{8}$ ; C. 17.

Preopercle usually convex, lower limb entire, the rest serrated, more coarsely so at the angle. Small canines in both jaws, the outer row in the maxilla, and the inner in the mandible, larger than the villiform bands. Dorsal spines strong, from the third, of equal length, rays longer. Colour greyish, with various-sized brown spots irregularly disposed, these spots on the head are sometimes hexagonal. Pectoral and caudal banded. Some narrow white lines cross the lower jaw.

The Andamans.

*S. ANGULARIS*, Cuv. et Val.

*S. glaucus*, Day.

B. vii.; D.  $\frac{11}{16}$ — $\frac{17}{17}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{3}{8}$ ; C. 17.

Preopercle serrated, angle slightly produced with two or three strong denticulations. Canines in both jaws, upper largest. Other teeth as in *S. fuscoguttatus*. Colour greyish, becoming dirty white on the belly. Head and body closely yellow spotted. Fins also spotted and with a black margin edged with white.

The Andamans.

*S. MINIATUS*, Forsk.

*S. cyanostigmatoïdes*, Bleeker.



B. vii.; D.  $\overline{15}^{\overline{2}}\overline{16}$ ; P. 18; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

Vertical limb of preopercle finely serrated, and usually somewhat emarginate above its angle. The fourth or fifth dorsal spine the longest. Uniform scarlet. Body, cheeks, opercles, dorsal, caudal and anal fins covered with large blue spots.

The Andamans.

*S. GUTTATUS*, Bloch.

*S. argus*, Bloch.

B. vii.; D.  $\overline{15}^{\overline{9}}\overline{16}$ ; P. 18; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

Vertical limb of preopercle rounded and finely serrated, lower limb entire. Dorsal spines strong, increasing to the fourth and fifth. Reddish brown, and generally darker vertical bands. Head, body and fins covered with numerous small blue spots. Dorsal, anal and caudal white bordered.

The Andamans.

*S. LEOPARDUS*, Lacép.

*S. Homfrayi*, Day.

B. vii.; D.  $\overline{15}^{\overline{2}}\overline{17}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

Vertical limb of preopercle rounded and very finely serrated. Teeth as in *S. fasciatus*. The fifth dorsal spine the longest. Body whitish, covered with rounded or oval red spots. A dark band from the eye to the upper opercular spine, behind which it ends in a black spot. Tail black banded. Caudal with a white or blue spot at its outer angle and terminally banded. Colours vary, red or yellow predominating.

The Andamans.

*S. BOELANG*, Cuv. et Val.

B. vii.; D.  $\overline{15}^{\overline{9}}\overline{16}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

Preopercle with its vertical border and a little beyond the angle finely serrated. Dorsal spines behind the third, equal. Small canines in both jaws, the villiform bands of comparatively small size. Colour purplish with from 8 to 9 vertical bands on the body, not so wide as the interspaces, and that on the tail darkest.

The Andamans.

*GAMMISTES*, Cuvier.

Opercle and preopercle unserrated, but spinate. Teeth villiform in the jaws, vomer, and palate; no canines. A barbel, more or less rudimentary on the chin. Two dorsal fins, the anterior with 7 spines. Scales minute and buried in the epidermis.

*G. ORIENTALIS*, Bleeker.

B. vii.; D. 7,  $\overline{15}^{\overline{1}}\overline{15}$ ; P. 16; V.  $\frac{1}{2}$ ; A. 9-11; C. 17.

Caudal rounded. Colour, a deep chestnut brown, with from 3 to 7 white longitudinal bands, anteriorly continued on to the head.

The Andamans.

*LUTIANUS*, Bloch.

Branchiostegals 7. Preopercle serrated, with or without a notch on its vertical border. Villiform teeth both in jaws, vomer and palate. Canines in the upper jaw, and smaller ones anteriorly placed in the lower, and a row of canine-like teeth laterally. Dorsal fin single, with 9 to 13 spines. Pectorals pointed. Scales moderate, or small, with one or two enlarged rows over the nape.

*S. FULVUS*, Forst.

B. vii.; D.  $\frac{1}{3}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

Small curved canines in the upper jaw. An outer row of numerous canine-like teeth in either jaw. A band of villiform teeth on the palatines, and on a triangular spot on the vomer.

Vertical limb of preopercle with a very deep emargination, and a produced rounded angle; above the notch the limb is serrated, and on the angle almost spinate.

Dorsal spines strong, fourth longest, from which they decrease to the last. Scales in oblique rows above the lateral line, and horizontal ones below it. Colour uniform yellowish red, with a dark spot in the axil. A dark mark across the anal. Caudal black, edged with a white margin.

The Andamans.

*L. BIGUTRATUS*, Cuv. et Val.

B. vii.; D.  $\frac{13}{14}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $\frac{2}{3}$ ; C. 17.

Vertical limb of preopercle finely serrated, with a moderately deep emargination to receive an ill-developed interopercular knob, angle rounded, lower limb almost entire. A large canine on either side of the premaxillary, and between them two smaller curved teeth, and some similar ones along the upper jaw. In the lower jaw an outer row of curved canine-like teeth, becoming larger posteriorly. Dorsal spines weak, third and fourth longest. Scales as in *L. fulvus*. Colour above yellowish-grey, becoming yellowish-white on the sides and belly. A broad black band from the eye to the middle of the caudal, dividing the dark back from the paler sides, and a less marked one lower down. A pearly spot below the middle of the spinous dorsal, and a second under the rayed part of the fin.

The Andamans.

*L. CHRYSOTENIA*, Bleeker.

B. vii.; D.  $\frac{11}{12}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $\frac{2}{3}$ ; C. 17.

Preopercle finely serrated throughout, its angle rounded, but not produced, and with a very shallow emargination. No interopercular knob. A pair of large curved canines above, and a row of curved canine-like teeth in both jaws, more closely set, but smaller in the upper. Villiform teeth on vomer in a lanceolate or T-shaped patch, in a band in the palate, and a patch on the tongue. Scales as in *L. fulvus*. Dorsal spines weak, third longest. Colour olive green. Three dark bands from the eye, the lowest bordered below with a golden band, with a fourth dark band beneath. Belly golden. A deep black spot in the pectoral axil. Colours vary somewhat.

The Nicobars.

*L. ARGENTIMACULATUS*, Gmel.

To-go-re-dah. Andamans.

B. vii.; D.  $\frac{13}{14}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $\frac{2}{3}$ ; C. 17.

Preopercle with a shallow emargination to vertical limb, a rounded angle and oblique lower limb. Vertical border finely serrated, angle and lower border more coarsely. Large canines in the premaxillaries, and a row of canine-like teeth in either jaw, the mandibular ones largest. Villiform teeth on the palate, and in a scabrous patch on the tongue. Scales in horizontal rows. Dorsal spines increase to the third and decrease from the fifth. Cherry-red, darker on bases of scales. Upper edge of spinous dorsal orange. Sometimes the fins are dark spotted.

The Andamans.

*L. JOHNII*, Bloch.

Nga-pa-ni.

B. vii.; D.  $\frac{13}{14}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $\frac{2}{3}$ ; C. 17.

Vertical limb of preopercle finely serrated, more coarsely on its produced and rounded angle. Lower limb with a few serrations and crenulations. Teeth much as in the last species. Scales above the lateral line are parallel with the dorsal profile, below it, horizontal. Yellowish, paler on the belly, and a large black finger-mark on the lateral line between the 22nd and 31st scales. A dark line along each row of scales. Fins dashed with red. Grows to a foot or more.

Burma.

*L. QUINQUELINEATUS*, Bloch.

B. vii.; D.  $\frac{13}{14}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $\frac{2}{3}$ ; C. 17.

Preopercle with a shallow emargination above its angle. Vertical limb finely serrated, lower, entire. A very strong curved canine on either side of the premaxillary with an intermediate smaller pair. An outer row of curved canine-like teeth in both jaws, largest in the *lower*. Villiform teeth in a narrow band on the palatines, on a  $\Delta$  patch on the vomer, and along the centre of the tongue. Scales as in *L. fulvus*. Dorsal spines moderate, fourth longest. Colour, five or six blue bands run from the eye down the back and sides. A dark mark at the base of the pectoral and another below the commencement of the soft dorsal.

The Andamans.

*L. GIBBUS*, FORSK.

B. vii.; D.  $1\frac{1}{2}$ ; P. 18; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

Vertical limb of preopercle with a very deep emargination, succeeded by a broad and deep angle, equal to half its height. Above the notch the serrations are fine; over the angle, and a little way on the lower limb, they are coarse. Large canines in the premaxillaries. An outer row of curved canine-like teeth in both jaws, the posterior ones above, directed slightly forwards. Villiform teeth on a band on the palatines, and on a  $\Delta$  area on the vomer. None on the tongue. Colour crimson. Scales as in *L. fulvus*. Dorsal and anal fins black with a dark basal band, and edged with white margin. Pectorals and ventrals yellow. Caudal dark purple. Grows at least 16 inches.

The Andamans.

*L. QUINQUELINEARIS*, Bloch.

B. vii.; D.  $1\frac{1}{3}$  to  $1\frac{1}{2}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

Vertical limb of preopercle deeply emarginate, with a rounded angle. Vertical and lower limbs serrated. Upper canines moderate and curved. An outer row of canine-like teeth in both jaws, largest in the *upper*. Villiform teeth as in *L. gibbus*. Dorsal spines moderate, fourth longest. Scales as in *L. fulvus*. Colour olive yellow, with five blue bands down the body from the eye. Fins yellow. A deep black mark below the dorsal, and some dark lines on the nape.

The Andamans.

*L. DECUSSATUS*, Cuv. et Val.

B. vii.; D.  $1\frac{1}{3}$  to  $1\frac{1}{2}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

Vertical limb of preopercle with a shallow emargination, and finely serrated as far as the angle. One or two large curved canines in the premaxillaries, and an outer row of curved canine-like teeth in both jaws, rather larger, less curved, and wider apart below. Villiform teeth as in *L. gibbus*. Third, fourth, and fifth dorsal spines longest. Scales as in *L. fulvus*. Colour whitish, with six longitudinal black bands down the body, decussated by six ill-marked vertical ones over its upper third. A deep black spot at the root of the caudal. A white band across the occiput. Fins greyish-white, edged in front.

The Andamans.

*AMBASSIS*, *Curier et Valenciennes*.

Branchiostegals 6. Body compressed, more or less diaphanous. Lower limb of preopercle with a double serrated edge. Two dorsal fins, the first with seven spines. A forwardly directed recumbent spine in front of the dorsal.

Small fishes a few inches in length.

*A. XAMA*, Ham. Buch.

B. vi.; D.  $7\frac{1}{3}$  to  $1\frac{1}{2}$ ; P. 13; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

Blunt serrations along the horizontal limb of preopercle and on preorbital. Lower jaw longer than the upper. Large curved canines in lower jaw. Colour yellowish olive covered all over with minute black dots, which are collected on the shoulder into a vertical oblong patch. Summit of head and top of eyes black. Fins orange. Upper half of first dorsal black. Second dorsal black-edged. Caudal dark. Anal with a black mark over the base of spines.

India and Burma in fresh water.

*A. RANGA*, Ham. Buch.

B. vi.; D.  $7 \frac{1}{10} \frac{1}{11}$ ; P. 11; V.  $\frac{1}{2}$ ; A.  $\frac{1}{11} \frac{1}{10}$ ; C. 17.

Vertical limb of preopercle sometimes entire, more usually finely serrated, or sometimes coarsely. Teeth villiform in jaws, vomer, and palate. Colour olive with a dark shoulder mark composed of spots, the remains of a band in the young. The young are bright yellow with four or five dark vertical bands.

India and Burma in fresh water.

*A. BACULIS*, Ham. Buch.

Ngā-zin-zāt.

B. vi.; D.  $7 \frac{1}{13}$ ; P. 12; V.  $\frac{1}{2}$ ; A.  $\frac{1}{13}$ ; C. 17.

Colour yellowish olive. A golden spot on the occiput. This species differs from *A. nama* in its higher body, its lower jaw shorter than the upper, and its possessing no canine or enlarged teeth.

India and Burma in fresh water.

*A. NALCA*, Ham. Buch.

Kyoung-mā-sā.

B. vi.; D.  $7 \frac{1}{10} \frac{1}{11}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{3}{9} \frac{1}{10}$ ; C. 15.

Vertical limb of preopercle entire, save a few serrations above the angle. Teeth villiform in jaws, vomer, and palate, and a narrow median band on the tongue. Colour silvery, with a burnished lateral band. A dark band along either lobe of tail.

India. The Andamans, in fresh, brackish, or salt water.

*A. COMMERSONI*, Cuv. et Val.

*A. macracanthus*, Bleeker.

B. vi.; D.  $7 \frac{1}{9} \frac{1}{11}$ ; P. 13; V.  $\frac{1}{2}$ ; A.  $\frac{3}{9} \frac{1}{10}$ ; C. 15.

Vertical limb of preopercle entire, double edge of lower limb serrated, with two or three coarser teeth at the angle. Dorsal spines strong, transversely lineated, second longest. Teeth villiform in the jaws, and in a  $\Delta$ -shaped row in the vomer, and some on the palatines. Colour silvery, with purplish reflexions. A bright silvery line from the eye to the tail. Interspinous web between the second and third dorsal spines, dark.

The Andamans.

*A. INTERRUPTA*, Bleeker.

B. vi.; D.  $7 \frac{1}{9} \frac{1}{10}$ ; P. 13; V.  $\frac{1}{2}$ ; A.  $\frac{3}{9} \frac{1}{11}$ ; C. 18.

Vertical limb of preopercle entire. Second spine of dorsal nearly half the length of body of adult. Colour silvery, with a narrow lateral band. Second spine of the dorsal bright orange, the web between it and the third black. Tail as in *A. nalca*.

The Andamans in salt water.

*A. UROLENIA*, Bleeker.

B. vi.; D.  $7 \frac{1}{9} \frac{1}{10}$ ; P. 13; V.  $\frac{1}{2}$ ; A.  $\frac{3}{9} \frac{1}{10}$ ; C. 18.

Vertical limb of preopercle entire, save two serrations above the angle. Second spine of dorsal longest. Colour silvery, with a burnished lateral band. The interspinous membrane between the second and third dorsal spines black. Tail as in *A. nalca*.

The Andamans, in salt water.

Although, remarks Day, this genus (*Ambassis*) consists of little bony fishes which rarely exceed six inches and are usually far less, still they have their economic uses, and are eaten by the poor, and owing to their conformation are easily dried without salt. They are also freely consumed by larger fish. At Pinang, Cantor remarks, they are used with the refuse of the market for manure.

Apogon, *Lacépède*.

Branchiostegals 7. Teeth villiform in jaws, vomer, and palate. No canines. Tongue smooth. Two separate dorsal fins, the first with six or seven spines.

*A. WASSINKI*, Bleeker.

B. vii.; D. 7  $\frac{1}{2}$ ; P. 14; V. 3; A. 1; C. 17.

Lower jaw slightly longer. Preopercle serrated throughout on its outer edge; the other bones of the head and shoulder entire. Third and fourth dorsal spines longest. Colour brilliant golden, with a black head. Fins orange. A silvery median band on the top of the head, and three silvery bands down each side of the body, and a fourth from the gape to below the base of the pectoral.

The Andamans.

This fish, Day remarks, is common on the coral reefs, and on the water being struck, they crowd into the coral for shelter, apparently afraid that the splash has been caused by some large carnivorous fish.

*A. AURITAS*, Cuv. et Val.

B. vii.; D. 7  $\frac{1}{2}$ ; P. 12; V. 3; A. 1; C. 17.

Jaws of equal length. Preopercle entire. First dorsal spine very short, the third and fourth the highest. Colour, body and head spotted and marbled all over with brown. A circular black spot on the opercle, inclosed by a narrow white ring, visible even in the fry.

The Andamans.

*A. SANGHENSIS*, Bleeker.

B. vii.; D. 6  $\frac{1}{2}$ ; P. 13; V. 3; A. 1; C. 17.

Outer edge of preopercle very finely serrated. Dorsal spines weak, the third generally longest. Colour golden, tinged with red. A wide brown band from the snout, through the eye, ending on the opercle, or in a black spot behind the shoulder. A round black spot on the tail, and a minute black spot close behind the base of the last dorsal ray. Upper half of first dorsal black.

The Andamans.

*A. ORBICULARIS*, Cuv. et Val.

B. vii.; D. 6  $\frac{1}{2}$ ; P. 12; V. 3; A. 1; C. 17.

Lower jaw the longer. The outer edges of both limbs of the preopercle serrated, as is also the shoulder-bone, the other bones of the head entire. The second and third dorsal spines slightly higher than the fourth. Caudal forked, its three outer rays rather spinate and projecting. Colour olive brown. A dark zone round the body in front of the first dorsal and behind the ventral. Head black-spotted. Dark spots on tail and first dorsal. Ventral nearly black.

The Andamans.

*A. CERAMENSIS*, Bleeker.

B. vii.; D. 6  $\frac{1}{2}$ ; P. 14; V. 3; A. 3; C. 17.

Upper jaw slightly the longer. Opercle serrated over its outer edge. The third dorsal spine is slightly the longest. Caudal notched. Colour greenish brown, with some dark spots on the head. A narrow blackish-brown band from the head to the base of the caudal, where it ends in a round black blotch: anteriorly the band is margined above and below by a bluish-white streak. A brown blotch on the shoulder. The interspinous web between the second and third dorsal spine is black.

The Nicobars.

*CHEILODIPTERYUS*, *Curier et Valenciennes*.

Branchiostegals 7. Preopercle with a double edge. Villiform teeth in jaws, vomer, and palate. Canines usually present in both jaws, and lateral canine-like ones also. Two dorsal fins, separated; the first with six spines.

*C. LINEATUS*, Forsk.

B. vii.; D. 6  $\frac{1}{2}$ ; P. 13; V. 3; A. 3; C. 17.

Outer edge of preopercle serrated; finely on vertical limb, and more coarsely on the horizontal. Canines and canine-like teeth in both jaws. Dorsal spines weak, the

second and third equal. Caudal forked. Colour silvery-red, with horizontal bands along the head and body, varying from 7 to 10. A black spot at the base of the caudal, which is light-edged. Fins red. The first dorsal interspace between second and third spines black.

The Andamans.

*C. QUINQUELINEATUS*, Cuv. et Val.

Much resembles the last, of which it might be a variety, but the lateral bands are five only. A black spot at the root of the tail surrounded with a bright yellow annulus.

The Nicobars.

*DUCES*, *Cuvier et Valenciennes*.

Branchiostegals 6. No canines. A single dorsal fin with ten spines.

*D. ARGENTEUS*.

B. vi.; D.  $\frac{1}{9}$  -  $\frac{1}{10}$ ; P. 15; V.  $\frac{1}{5}$ ; A.  $\frac{3}{10}$  -  $\frac{3}{11}$ ; C. 17.

Preopercle evenly serrated on its horizontal limb. Dorsal spines not very strong, the fifth and sixth highest. Caudal forked. Colour bluish, becoming silvery white on the sides and belly. Dorsal greyish-black along its upper third, and white margined. Caudal milk-white with a central black band, and two oblique yellowish-black ones. Grows to 6 inches or more.

The Andamans.

*THRAPON*, Cuvier.

Branchiostegals 6. Villiform teeth in both jaws, the outer sometimes larger, and deciduous ones on the vomer and palatines. Dorsal single, more or less notched. Air-vessel constricted.

*T. JARBA*, Forsk.

Nga-sa-ba-sā.

B. vi.; D.  $\frac{1}{5}$  -  $\frac{1}{10}$ ; P. 13; V.  $\frac{1}{5}$ ; A.  $\frac{3}{8}$  -  $\frac{3}{9}$ ; C. 17.

Vertical limb of preopercle with 12 to 14 serrations, the two at the angle being the strongest, on the lower limb about 8 weaker ones. An enlarged outer row of teeth in the jaws, and fine ones generally present on the vomer and palatines. Dorsal spines moderately strong, the third and fourth longest. Colour bluish-grey, becoming white on the belly, with a tinge of gold on the cheeks and snout. Three longitudinal reddish-brown bands down the body, slightly convex below, sometimes a fourth occurs on the belly. Dorsal interspinous web milk-white, black-marked between the third and sixth spines. First three dorsal rays black-tipped. Caudal with two oblique bands across each lobe. Grows to 13 inches or so.

Arakan.

This fish, remarks Tickell, is called the paddy eater in Arakan, from its young being so often seen in the inundated rice-fields.

*DIGRAMMA*, Cuvier.

Body oblong, compressed. Mouth small, protractile. Lips thick and folded back. Preopercle serrated, 4 or 6 open pores below the mandible, but no groove. Teeth in jaws. No canines or palatine teeth. Air-vessel simple.

*D. CRASSISPINUM*, Rüpp.

*D. altum*, Day.

B. vii.; D.  $\frac{1}{10}$  -  $\frac{1}{12}$ ; P. 17; V.  $\frac{1}{6}$ ; A.  $\frac{2}{7}$ ; C. 17.

Dorsal spines strong, the alternate ones thicker on one side; the fourth highest. Slaty-grey, with a violet tinge over the head and a brassy one over the body. Fins nearly black. Some coppery spots on the body and a tinge of the same over the spiny dorsal. Grows to 2 feet, and is good eating.

The Andamans.

*SCOLORSIS, Cuvier et Valenciennes.*

Branchiostegals 5. A single dorsal fin with ten spines. Air-vessel simple, uncontracted.

*S. BILINEATUS, Bloch.*

B. v.; D.  $\frac{1}{9}$ ; P. 16; V.  $\frac{1}{3}$ ; A.  $\frac{3}{7}$ ; C. 17.

Vertical limb of preopercle serrated, and its angle produced and rounded. Teeth villiform. Dorsal spines not strong, increasing in height to the fourth. Colour, a white band from the snout to the base of the dorsal; a second from above the orbit to beyond the dorsal; a third from the upper edge of the eye to the lateral line. A broad black-bordered yellow band from the mouth to the commencement of the soft dorsal, with a yellow blotch below the same fin, which is edged anteriorly with black. Anal black anteriorly, white behind.

The Andamans.

*S. GHANAM, Forsk.*

B. v.; D.  $\frac{1}{9}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{3}{7}$ .

Scaleless portion of the head covered with numerous small pores. Vertical limb of preopercle strongly serrated, and more coarsely on its produced angle. Teeth fine. Dorsal spines rather weak, increasing to the fifth. Colour olive, with four yellowish-white bands, the third of which bifurcates at the shoulders into two, one above, the other below the lateral line. A black spot in the pectoral axil. The anterior scales below, mostly black-spotted at their base. A violet mark at the base of either lobe of the tail.

The Andamans.

*S. MONOGRAMMA, Cuv. et Val.*

B. v.; D.  $\frac{1}{9}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{3}{7}$ .

Upper surface of head flat and scaled nearly to the nostrils. Vertical limb of preopercle, and its rounded and produced angle, evenly serrated. Dorsal spines slender, increasing to the fourth. Colour olive, with a black band, one scale broad, from the snout, through the eye to the tail, only rising above the lateral line behind the end of the dorsal. Fins immaculate.

The Andamans, where common.

*S. CANCELLATUS, Cuv. et Val.*

B. v.; D.  $\frac{1}{9}$ ; P. 15; V.  $\frac{1}{3}$ ; A.  $\frac{3}{7}$ ; C. 17.

Scaleless portion of the head studded with fine open pores. Vertical limb of preopercle serrated, more coarsely superiorly, and at its slightly produced and rounded angle. Teeth fine. Dorsal spines weak, increasing to the fifth. Colour grey above, whitish below. A white band to the commencement, and another below it, to the end of the dorsal. A third white band from the eye as far as the end of the pectoral, and a fourth from the eye to the tail. Some irregular white vertical bands cross the back. A black spot between the first and third dorsal spines.

The Andamans.

*S. CILIATUS, Lacép.*

B. v.; D.  $\frac{1}{9}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{3}{7}$ ; C. 17.

A prominent ridge, with serrated edge, on the maxilla. Vertical edge of preopercle serrated, most strongly at the angle, which is not produced. Teeth villiform. Dorsal spines slender, increasing to the fifth. Colour greenish olive above, paler below. A silvery white band along the side from the head to the commencement of the soft dorsal. The scales below the lateral line gold spotted. Fins reddish.

The Andamans.

*SYNAGRIS, Günther.*

Branchiostegals 5 or 6. One scaleless dorsal fin, with 10 spines and 9 rays. Air-vessel not constricted, but notched posteriorly.

*S. NOTATUS*, Cuv. et Val.

B. vi.; D.  $\frac{10}{9}$ ; P. 15; V.  $\frac{1}{1}$ ; A.  $\frac{3}{2}$ ; C. 17.

Preopercle entire. Opercle with a small flat spine. Teeth villiform in the upper jaw, with four large curved canines in either premaxillary, and laterally an outer row of conical teeth of moderate size. In the mandible, villiform teeth in the front and six well-developed canine-like ones, and a lateral row of conical teeth, small behind. Dorsal spines weak, increasing to the fifth. Caudal forked, upper lobe the longest. Colour rosy, with a brilliant spot on the first five scales below the lateral line, the upper half red, the lower yellow; 5 or six longitudinal yellow bands below the lateral line, and 3 silvery white ones. Fins pinkish, with a yellow band along the bases of the dorsal and anal.

The Andamans.

*APRION*, *Cuvier et Valenciennes*.

Preorbital entire. Preopercle serrated. Canines anterior. Villiform teeth in jaws, vomer, and palate, and an outer row of canine-like ones laterally. Dorsal fin single, with 9 to 11 spines. Anal with 3. Caudal deeply forked.

*A. MULTIDENS*, Day.

B. vii.; D.  $\frac{10}{11}$ ; P. 16; V.  $\frac{1}{1}$ ; A.  $\frac{3}{3}$ ; C. 16.

Dorsal spines slender, the fifth longest. Colour rosy, with six longitudinal yellow bands along the body. A golden band from the snout to the inferior angle of the eye and another across the forehead.

Common at the Andamans, where it reaches a large size.

*DATNIODES*, *Bleeker*.

Branchiostegals 6. Premaxillaries very protractile. Preopercle serrated. Villiform teeth in jaws without canines. Vomer, palate and tongue edentulous. A single dorsal with 12 stout spines. Air-vessel simple.

*D. ROTATA*, Ham. Buch.

Ngā-kyā and Nyā-wet-mā.

B. vi.; D.  $\frac{12}{13}$ ; P. 19; V.  $\frac{1}{1}$ ; A.  $\frac{3}{3}$ ; C. 17.

Brown, with several cross bands.

Grows to a foot, and is eaten by the poorer classes.

Inhabits tidal rivers and estuaries in Burma.

*GERRES*, *Cuvier*.

Branchiostegals 6. Mouth very protractile and descending when produced. Preopercle rarely serrated. Villiform teeth in the jaws. The dorsal fin capable, wholly or partially, of reception into a scaly sheath. The dorsal spines 9 or 10, the rays 10 or 11. Caudal forked. Air-vessel simple.

*G. OBLONGUS*, Cuv. et Val.

B. vi.; D.  $\frac{9}{10}$ ; P. 17; V.  $\frac{1}{1}$ ; A.  $\frac{3}{2}$ ; C. 17.

Preopercle entire. Dorsal spines not very strong, compressed, the second curved and much the highest. Caudal deeply forked. Colour silvery, eye golden.

The Andamans.

*G. ABBREVIATUS*, Bloch.

B. vi.; D.  $\frac{9}{10}$ ; P. 15; V.  $\frac{1}{1}$ ; A.  $\frac{3}{2}$ ; C. 17.

In Andamanese specimens the angle and lower limb of preopercle is crenulated, but not serrated, whilst in specimens from the Malay Archipelago it is entire. Dorsal spines strong, the second longest, and curved. Caudal deeply forked, the upper lobe slightly the longer. Scaly sheaths of dorsal and anal well developed. Colour silvery white, darkest along the back, each scale with an indistinct spot, forming longitudinal bands. Fins yellowish. Dorsal with a blackish edge, and a spot on each spine and ray just above the sheath.

The Andamans.



*G. FILAMENTOSUS*, Cuv. et Val.

Ngā-wet-sāt.

B. vi.; D.  $\frac{10}{16}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{2}{2}$ ; C. 17.

Preopercle entire, with rounded angle. Teeth fine in the jaws. Dorsal spines of moderate strength, the second prolonged, sometimes in the adult extending to the caudal. Colour silvery, with rows of short oblong horizontal bluish spots along the upper half of the body, continuous below the scales in lines. Snout black. A basal black spot on each dorsal spine and ray. Caudal greyish externally. Fins yellow, web dotted. The young have vertical bands, the alternate ones shorter. Grows to 8 inches or more.

Coast of Burma.

*G. LUCIDUS*, Cuv. et Val.

B. vi.; D.  $\frac{10}{16}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{2}{2}$ ; C. 17.

Preopercle entire. Teeth fine. Dorsal spines of moderate strength, and not curved, the first very short, the third longest. Colour silvery, with an indistinct dark vertical band over the nape; a second below the dorsal spines and two more below the soft dorsal. Snout black. Fins canary-yellow. The upper half of the web between the second and fifth dorsal spines black, the rest of the fin dark-edged with black margin. A median row of dark spots down the dorsal. Caudal grey-edged, the inferior lobe with a very narrow white edge and white tip.

Coast of Burma.

It is, remarks Day, the most common Indian species, visiting the coasts in enormous numbers.

The different species of *Gerres* are but little esteemed as food, on account of their numerous bones and deficiency of flavour, and are consequently principally consumed fresh by the poorer classes. They are also extensively salted and dried.

#### Family *Chætodontidæ* (SQUAMIPINNES).

Mouth generally small. Teeth villiform or setiform, with neither incisors nor canines. Soft portion of dorsal exceeds its spinous. Ventrals thoracic, with 1 spine and 5 rays. Air-vessel present, generally simple.

##### A. *No palatine teeth.*

*CHÆTODON*, *Cuvier*.

Branchiostegals 6. Body elevated and strongly compressed. Spinous and soft portions of dorsal continuous.

##### a. *Anal with 4 spines.*

*C. PLEBEIUS*, Gmel.

B. vi.; D.  $\frac{13\frac{1}{2}}{13\frac{1}{2}}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{2}{16-16}$ ; C. 17.

Colour yellow, with a black, white-edged ocular band. A black, white-edged ocellus at the base of the caudal.

The Andamans.

##### b. *Anal with 3 spines.*

*C. FALCULA*, Bloch.

B. vi.; D.  $\frac{12\frac{1}{2}}{12\frac{1}{2}} \frac{13\frac{1}{2}}{13\frac{1}{2}} \frac{14\frac{1}{2}}{14\frac{1}{2}}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{2}{12-12}$ ; C. 17.

Snout produced. Teeth brush-like. Colour of head and body red-lilac-purple, turning to primrose posteriorly, and on the fins. A dark, white-edged ocular band, narrower than the orbit, runs vertically through the eye and in front of the dorsal. A black triangular blotch with its base on the first 4 or 5 dorsal spines and its apex on the lateral line, and a second having its base on the last 3 spines. A black band

on the base of the tail. Body vertically barred with 12 or 14 black lines. Soft dorsal with a narrow black margin. Caudal with a black and white posterior edge. Anal with a black submarginal line. The disposition and white margining of the black bands is variable.

The Nicobars.

*C. pictus*, Forsk.

Nga-gyeng-kyouk.

B. vi.; D.  $\frac{1}{2}$ – $\frac{3}{4}$ ; P. 15; V.  $\frac{1}{3}$ ; A.  $\frac{3}{20}$ – $\frac{3}{22}$ ; C. 17.

Teeth brush-like. Snout with a black band. A dark band descends from in front of the dorsal through the eye to the chest. The body is traversed anteriorly and superiorly by numerous black lines (8), which ascend from the head to the dorsal, and it is traversed posteriorly and inferiorly by similar descending lines, impinging at right angles on the lowest of the ascending ones. A black band involves the posterior portion of the body. A crescentic black band anteriorly convex and a subterminal linear one on the tail.

The Andamans.

*C. vagabundus*, L.

Pah-noo-dah. Andamans.

B. vi.; D.  $\frac{1}{2}$ – $\frac{1}{2}$ – $\frac{1}{2}$ ; P. 15; V.  $\frac{1}{3}$ ; A.  $\frac{3}{20}$ – $\frac{3}{22}$ ; C. 17.

Teeth brush-like. Dorsal spines moderate, with deeply notched web. Colour markings much as in *C. pictus*, but the anterior ascending lines are less numerous (6), and the posterior descending ones more marked and numerous than in that species (*vide* Day's Plates, xxvi. f. 6, xxvii. f. 1). The black ocular band white-edged. Dorsal and anal fins black-margined. Tail banded as in *C. pictus*.

The Andamans.

*C. auriga*, Forsk.

B. vi.; D.  $\frac{1}{2}$ – $\frac{1}{2}$ – $\frac{1}{2}$ ; P. 15; V.  $\frac{1}{3}$ ; A.  $\frac{3}{20}$ – $\frac{3}{21}$ ; C. 17.

Teeth brush-like. Ocular band brown, edged anteriorly with white. The linear body-markings as in *C. pictus*, only the ascending lines are reduced to 5 and the descending to 6, followed by three angular bands. A prominent black ocellus on the soft dorsal. Anal with a fine submarginal band, with a white outer edge. Upper and hind margin of anal edged with black. Two dark lines on the caudal inclose a crescentic area anteriorly convex.

The Nicobars.

*C. lunula*, Lacép.

*C. biocellatus*, Cuv. et Val.

B. vi.; D.  $\frac{1}{2}$ – $\frac{2}{3}$ ; P. 19; V.  $\frac{1}{3}$ ; A.  $\frac{3}{18}$ – $\frac{3}{20}$ ; C. 17.

Ocular band of a deep chestnut, edged with white and wider than the orbit. A second brown band passes from the first five dorsal spines and unites with the occipital one. A third band from fifth and sixth dorsal spines gradually widens and goes as low as the base of the pectoral fin. A band along the base of the soft dorsal passes over the free portion of the tail. Caudal with a dark band in its posterior third. Dorsal and anal with a dark edge, margined with white. In the young the ocular band is edged with white and a white-edged black ocellus occurs on the soft dorsal.

The Andamans.

*C. melanotus*, Bl. Sehn.

Ngā-hpā-kheh (*vide* Gazetteer).

B. vi.; D.  $\frac{1}{2}$ ; P. 15; V.  $\frac{1}{3}$ ; A.  $\frac{3}{18}$ ; C. 17.

Colour yellowish, with a narrow black ocular band descending to the chest. The upper fourth of the body stained with black and ascending black lines through each row of scales. A black band at the base of the tail interrupted in the middle.

Fins yellow. A narrow black submarginal band, exteriorly white-edged, along the anal and soft dorsal. A yellow band, black bordered externally down the caudal. A short black band at the base of the first five anal rays.

Presumably common on the coast if it possesses a vernacular name.

*CHELMO*, *Cuvier*.

Snout produced as a long round tube by the horizontal elongation of the premaxillaries and mandible, which are laterally connected by a web, the gape of the mouth anteriorly being small. Day includes two species of this genus as inhabiting the seas of India (*C. longirostris* and *C. rostratus*), and adds, "Due to this tubular elongation of the snout, these fishes are able to employ it as a blow-pipe, from which they discharge globules of water at insects flying above them." I know not if these are the only fishes which ejaculate a drop of water at passing insects, but some fish is common in the tidal rivers of Burma which captures insects on the sides of boats by bombarding them in this fashion, as I have repeatedly witnessed. These fishes have all the aspect of a *Chatodon*.

*HEXIOCHUS*, *Cuvier et Valenciennes*.

Branchiostegals 5. Body elevated and strongly compressed. Teeth villiform. A single dorsal fin. The fourth dorsal spine is elongated and filiform. Air-vessel present.

*H. MACROLEPIDOTUS*, *Artedi*.

Pah-no-dah. Andamans.

B. v.; D.  $\frac{11}{2}$  -  $\frac{12}{2}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{17}{17}$  -  $\frac{18}{18}$ ; C. 17.

The filamentous prolongation of the fourth dorsal spine reaches to the tail or beyond. Colour pearly-white, with a dark purplish band over the snout; another over the eyes. A third broad one extends from the first three dorsal spines, and posterior two-thirds of the opercle downwards, and includes the whole of the ventral fin, and extends back to the anal. The last band commences at the summit of the *fifth* dorsal spine, passes down to the base of the seventh, and ends in the posterior third of the anal. Pectoral, soft dorsal, and caudal fins bright yellow.

The Andamans.

The colour of the ground and the bands of this species is occasionally seen transposed. In the Plate xxviii. f. 3 (Fishes of India) the last band is shown to commence from the *sixth* dorsal spine, not the *fifth*, as stated in the text.

*HOLACANTHUS*, *Lacépède*.

Branchiostegals 6. Body compressed and usually much elevated. A single dorsal fin. Air-vessel with two horns posteriorly.

a. *Scales small*.

*H. NICOBARIENSIS*, *Bl. Schn.*

B. vi.; D.  $\frac{13}{2}$  -  $\frac{14}{2}$ ; P. 19; V.  $\frac{1}{2}$ ; A.  $\frac{20}{20}$  -  $\frac{21}{21}$ ; C. 18.

Colour variable. In the young it is deep blue, with slightly curved vertical bands, alternately white and bluish-white, the former broader. Caudal white, with or without a black outer margin. In some specimens there are reticulated blue lines between the broad white postocular band and one descending from the centre of the spinous dorsal. In the adult the vertical bands are more curved with the convexity forwards. In some (the type) a white spot forms the centre round which the body bands curve.

The Nicobars. Seas of India, etc.

*H. ANNULARIS*, *Gmel.*

Ngā-lyk-pyā, Arakan.

B. vi.; D.  $\frac{13}{2}$  -  $\frac{14}{2}$ ; P. 20; V.  $\frac{1}{2}$ ; A.  $\frac{20}{20}$  -  $\frac{21}{21}$ ; C. 17.

Colour sienna, with a blue ring on the shoulder. Six or seven arched blue bands radiate from the head and converge towards the tail. A narrow blue interorbital

band is continued behind the eyes over the opercle, curving up its hind edge towards the ring. A second across the snout, passes under the eye, across the opercle, and joins the third on the body. Pectoral yellow, with a blue band at its base. Dorsal and anal dark. The six body bands are continued on to the former, where some intermediate blue lines also occur. Dorsal edged above with blue. Anal with three blue lines and a light blue margin. Caudal yellow, with a narrow orange tip.

Coasts of Burma.

II. XANTHOMITOPON, Bleeker.

B. vi.; D.  $\frac{14}{7}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{3}{7}$ ; C. 17.

Colour blue. Cheeks and opercles with many black-edged gold spots. Some fine black lines on lips and chin. A broad yellow interorbital band. Body violet, each scale with a brilliant blue spot. A yellow spot on the shoulder. Dorsal, caudal and pectoral fins yellow, with a black spot at the bases of the last seven dorsal rays. Caudal black-edged. Ventral and anal white, with a blue edge.

The Andamans.

SCATORHAGUS, *Cuvier et Valenciennes*.

Branchiostegals 6. Body compressed and elevated. Two dorsal fins united at their bases, the first having 10 or 11 spines, and an anterior recumbent one directed forwards. Air-vessel simple.

S. ARGUS, Gmel.

Gnā pa-thwōn. Po-ra-dah. Andamans.

B. vi.; D.  $10 \frac{1}{16} \frac{1}{17}$ ; P. 20; V.  $\frac{1}{2}$ ; A.  $\frac{1}{11} \frac{1}{16}$ ; C. 16.

Teeth villiform in the jaws. Dorsal spines strong, each alternate one thicker on one side, interspinous web deeply notched, fourth spine the highest. The anterior rays the longest, but not equalling the fourth spine. Colour purplish, becoming white on the belly. Large round blackish or greenish spots on the body, most numerous along the back, and varying in size and tint. First dorsal fin brownish blue, having a few minute spots. Second dorsal yellowish, with slight brown marks on the web.

Coasts of Burma.

This fish is a foul feeder, and consequently not in much request for food. When caught however out at sea, it is well flavoured enough, according to Tickell.

EMIPRUS, *Cuvier*.

Branchiostegals 6. Body much compressed and elevated. Dorsal with 8 or 9 spines, receivable into a groove at their base, and several elongated and flexible, with the interspinous web deeply cleft, and a deep notch between the spinous and soft parts of fin. Air-vessel bifurcate anteriorly and with two long horns posteriorly.

E. ORMS, Bloch.

Kol-lil-dah. Andamans.

B. vi.; D.  $\frac{8-9}{15}$ ; P. 19; V.  $\frac{1}{2}$ ; A.  $\frac{3}{15}$ ; C. 19.

The facial profile very elevated, rising abruptly from the snout to the dorsal fin. The third, fourth, and fifth spines are elongated and filiform, especially the third. Colour, back and head greyish-green, sides and belly silvery, shot with pink. Fin webs diaphanous, finely dotted with black, rays bluish white. The young have a dark orbital band, a second over the nape, and two over the belly.

The Andamans.

DREPANE, *Cuvier et Valenciennes*.

Branchiostegals 6. Body much compressed and elevated. Snout short. Dorsal with 8 or 9 spines receivable into a groove at their base, and anteriorly a concealed spine directed forwards. Interspinous web deeply notched. Pectorals long and falciform. Air-vessel posteriorly produced into two horns.

*D. punctata*, Gmel.

Ngā-sheng-na.

B. vi.; D.  $\frac{1}{2}$  $\frac{1}{1}$ — $\frac{2}{2}$  $\frac{2}{2}$ ; P. 17; V.  $\frac{1}{1}$ ; A.  $\frac{1}{18}$  $\frac{3}{17}$ ; C. 15.

Colour silvery, with a golden gloss and tinge of purple, with or without vertical bands and black spots. Edges of fins grey, and a grey band along the middle of the dorsal.

Coast of Burma.

A. *Villiform teeth in jaws, vomer and palate.*

*Toxotes*, *Cuvier*.

Branchiostegals 7. Body oblong, compressed, back depressed. Snout rather produced. Lower jaw the longer. A single dorsal, with 4 or 5 strong spines. Air-vessel simple.

*T. microlepis*, Blyth.

Ngā-kyā-mā.

B. vii.; D.  $\frac{1}{1}$  $\frac{5}{3}$ ; P. 12; V.  $\frac{1}{1}$ ; A.  $\frac{1}{17}$  $\frac{3}{7}$ ; C. 19.

The three posterior dorsal spines the longest. The dorsal commences slightly in advance of the anal. Colour golden, with two to four rows of black oblong blotches, or stripes along the sides, mostly above the lateral line. Dorsal blotched with black and dark-edged. Anal dark. Caudal yellow. Grows to a foot in length.

Rivers and estuaries of Burma.

*T. chatareus*, Ham. Buch.

B. vii.; D.  $\frac{1}{1}$  $\frac{5}{3}$ ; P. 13; V.  $\frac{1}{1}$ ; A.  $\frac{1}{16}$  $\frac{3}{17}$ ; C. 17.

The fourth dorsal spine the longest. The dorsal commences slightly in advance of the anal. Colour silvery shot with gold, dorsal profile greenish brown. Six or seven oblong spots between the eye and the end of the dorsal fin, some black blotches on the soft dorsal, anal edged below with black.

Rivers and estuaries of Burma.

*J. jaculator*, Pall.

B. vii.; D.  $\frac{1}{11}$  $\frac{4}{12}$ ; P. 15; V.  $\frac{1}{1}$ ; A.  $\frac{1}{11}$  $\frac{3}{17}$ ; C. 17.

Dorsal spines strong, the third the longest. The dorsal commences over the anal. Colour brownish shot with golden. Four triangular black blotches pass down from the back to the lateral line, most developed in the young. Fins dark. Grows to a foot in length.

The Andamans.

### Family *Mullidæ*.

Branchiostegals 4. Pseudobranchiæ. Two stiff barbels below the chin belonging to the hyal apparatus. Two dorsal fins, well apart. Ventral with one spine and five rays.

*Upeneoides*, Bleeker.

Teeth in both jaws, on the vomer and palatine bones.

*U. vittatus*, Forsk.

Chah-ti-ing-ud-dah. Andamans.

B. iv.; D. 8  $\frac{1}{1}$ ; P. 15-17; V.  $\frac{1}{1}$ ; A.  $\frac{1}{1}$ ; C. 15.

Colour chestnut on the back, golden below. Two or three bright yellow bands along the sides. First dorsal fin black tipped, and with two blackish bands. Pectoral pinkish edged with white; upper caudal lobe crossed by 5 or 6 yellowish-brown bars, having dark edges and with a black tip, whilst the lower lobe is white tipped and has three oblique dark bars. An air-vessel present.

The Andamans.

U. TRAGULA, Richardson.

B. iv.; D. 7-8  $\frac{1}{2}$ ; P. 13; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 15.

Colour silvery, head and body spotted with brown; a brown band down the side. Dorsal fin dark banded. Each lobe of caudal with 5 or 6 oblique black bars. Grows to about 5 inches.

The Andamans.

MULLOIDES, *Bleeker*.

Palate edentulous. Teeth in the jaws in several rows.

M. FLAVOLINEATUS, Lacép.

B. iv.; D. 7  $\frac{1}{2}$ ; P. 17-19; V.  $\frac{1}{2}$ ; A.  $\frac{2}{3}$ ; C. 15.

First three dorsal spines equal. Colour, upper surface of the head and back reddish chestnut, becoming whitish on the sides, and tinged with yellow on the belly. A narrow yellow band from above the eye to the snout, joined by a second from below the eye. A brilliant gold band from behind the eye to the tail. Fins carneous, a yellow band along the base of the second dorsal; lower lobe of tail grey. Grows to nearly a foot.

The Andamans.

UPENEUS, *Bleeker*.

Palate edentulous. A single row of teeth in either jaw.

U. MACRONEMUS, Lacép.

B. iv.; D.  $\frac{5}{8}$ ; P. 16, V.  $\frac{1}{2}$ ; A. 7; C. 15.

First dorsal spine very short; third and fourth equal, longest. Last dorsal and anal rays very elongated. Colour, a black band down the side from the snout to just past the end of the second dorsal and behind it, a black blotch at the base of the tail. Some scales on the sides gold-spotted. A purplish stripe from eye to snout. First dorsal violet. Second dorsal with a deep black band along its base. Ventral blackish externally, reticulated internally. Caudal black-edged. Grows to 9 inches or so.

Gulf of Martaban (Amherst).

U. INDICUS, Shaw.

U. *spilurus*, Day.

B. iv.; D.  $\frac{5}{8}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $\frac{2-3}{7}$ ; C. 15.

First dorsal spine very short, third and fourth equal, longest. Last dorsal ray not elongated. Colour purplish red, with a large oval shining golden blotch on the lateral line, between the dorsal fins. A blackish, pale-centred mark at the base of the tail. Belly yellow spotted, or lined. A broad purple band from eye to snout, with a narrow violet one on either side. Cheeks pink, variegated with yellow and tortuous blue lines. A dark spot at the gape. Dorsal fin purplish, streaked with blue. Anal yellow banded. Fins pinkish, except the caudal, which is greenish, with purplish rays. Grows to 16 inches.

The Andamans.

The marine 'mulletts' are most of them excellent fish for the table, and some species, as the 'red mullet' of Europe, is so highly esteemed as to be dressed with its entrails and excrement unremoved, to suit the perverted and uncleanly taste of the epicure, as is the case with the woodcock, whence the red mullet is also known as the 'woodcock of the sea.'

#### Family **Nandinæ.**

Branchiostegals 5 or 6. Dorsal fin single. Anal with 3 spines. Air-vessel present.

A. *Pseudobranchiæ* present.

PLESIOPS, *Cuvier*.

Branchiostegals 6. Villiform teeth on the jaws, vomer and palatines. Tongue edentulous.

*P. NIGRICANS*, Rüpp.

B. vi. ; D.  $\frac{1}{7}$ <sup>2</sup><sub>8</sub> ; P. 21 ; V.  $\frac{1}{4}$  ; A.  $\frac{3}{8}$  ; C. 16.

Dorsal spines much shorter than the rays. Soft dorsal pointed and elongate. Colour brownish, each scale on the body with a blue centre. Some scales on head and shoulders with several blue spots. Opercle with a large black, blue edged ocellus. Dorsal and anal fins blue banded. Dorsal, caudal and anal fins white margined. Soft dorsal and anal radiately streaked with blue. Caudal transversely blotched with blue.

The Andamans, where common.

B. *Pseudobranchiæ* absent.

BADIS, *Bleeker*.

Branchiostegals 6. Villiform teeth on the jaws, vomer, and palatines. Tongue edentulous.

B. BUCHANANI, *Bleeker*.

Pyin-leh-ngā-bye-mā and Ngā-mi-loung.

D.  $\frac{1}{7}$ <sup>6</sup><sub>10</sub> ; P. 12 ; V.  $\frac{1}{4}$  ; A.  $\frac{6}{8}$ <sup>3</sup><sub>8</sub> ; C. 16.

Soft dorsal rather elevated and pointed. Colour variable, barred black and red. In Burma the body has six vertical bands, each composed of four transverse black blotches one above the other. A large blotch on the shoulder and another on the tail. Grows to  $3\frac{1}{2}$  inches.

Fresh waters of Burma and Upper Burma.

NANDUS, *Curier et Valenciennes*.

Branchiostegals 6. Villiform teeth on the jaws, vomer, palatines and tongue.

N. MARMORATUS, *Chuv. et Val.*

B. vi. ; D.  $\frac{1}{11}$ <sup>2</sup><sub>13</sub> ; P. 16 ; V.  $\frac{1}{6}$  ; A.  $\frac{7}{8}$ <sup>3</sup><sub>9</sub> ; C. 15.

Dorsal spines rather strong, their base exceeding three-fourths of the fin. Soft dorsal similar to anal and almost square. Colour greenish brown with brassy lustre, vertically marbled with three broad pitchy bands, with another, or black blotch on the tail. Some black lines radiate from the eye. Narrow band of spots across the soft dorsal anal and caudal fins. Grows to 7 inches.

Fresh and brackish waters in Burma.

PRISTOLEPIS, *Jordan*.

Branchiostegals 6. Teeth villiform on jaws and palate, villiform or globular on vomer. Obtusely globular on the tongue, presphenoid and sometimes the vomer.

P. FASCIATUS, *Bleeker*.

B. vi. ; D.  $\frac{1}{11}$ <sup>2</sup><sub>13</sub> ; P. 15 ; V.  $\frac{1}{4}$  ; A.  $\frac{3}{8}$  ; C. 14.

Globular teeth on the vomer, base of the tongue and roof of the mouth. Dorsal spines strong; the central rays longest. Caudal rounded. Air-vessel large. Colour dull greenish, with a black spot on the axilla. Fins slate-coloured, except the pectoral, which is yellow, with a black spot over the upper part of its base. The young are banded. Grows to 8 inches or more.

Fresh waters of Burma.

### Family Sparidæ.

Branchiostegals 5 to 7. Pseudobranchiæ well developed. Palate edentulous (save in *Pimelopterus*). Cutting or conical teeth in front of the jaws, with or without a lateral series of molars. A single dorsal.

LETHRINUS, *Curier*.

Villiform teeth in the anterior portion of the jaws, with canines in front. Lateral teeth in a single row, and either conical or rounded. Dorsal, with 10 spines and 9 rays, receivable into a basal sheath.

*L. ORNATUS*, Cuv. et Val.

B. vi.; D.  $\frac{19}{10}$ ; P. 13; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

Four conical canines in either jaw. The first five upper lateral teeth conical and pointed, the rest with globular crowns. Teeth of mandible similar but smaller. Colour greenish-olive, with six or seven yellow horizontal bands. The opercular web red. Caudal edged with red. A violet band across the base of the pectoral.

The Andamans.

*L. HARAK*, Forsk.

Po-tang-dah. Andamans.

B. vi.; D.  $\frac{19}{10}$ ; P. 12; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 17.

The first four teeth of the lateral row conically obtuse, the rest are large and rounded. Colour greenish-olive, with an oblong blackish blotch below the lateral line, opposite the dorsal.

The Andamans.

*CHRYSOPHRYS*, *Cuvier*.

Branchiostegals 6. Three or four rows laterally of molars in either jaw. A single dorsal fin with from 11 to 13 spines.

*C. BERDA*, Forsk.

Ngā-wā. (Moo-roo-kee-dah. Andamans.)

B. vi.; D.  $\frac{11-12}{11}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8-10}$ ; C. 17.

Six incisors in front of either jaw. Three or four rows of molars in the lower jaw and four or five in the upper, the last of the inner series being the largest. Colour silvery-grey. Scales darker at their bases. Usually a black shoulder spot. Dorsal web black edged, as are the caudal and anal. Grows to 30 inches, is excellent food, and is called in Madras the 'black rock-cod.'

The Andamans.

### Family Cirrhitidæ.

*CIRRHITES*, *Cuvier*.

Branchiostegals 6. Preopercle denticulated. Opercle unarmed. Villiform teeth in both jaws. No teeth on the palatines. A single dorsal.

*C. FORSTERI*, Bl. Schn.

B. vi.; D.  $\frac{10}{11}$ ; P. 7 + vii.; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 15.

Anterior nostril rather valvular and fringed. Strong canines on either side of the symphysis of upper jaw. Two large and some small lateral conical canine-like teeth in the mandible. A triangular patch of villiform teeth on the vomer. Colour reddish, head, chest, and base of pectoral fins with black spots, a broad dark band along the middle of the body, to the upper half of the caudal fin. A wide yellow band from above the pectoral to the lower half of the caudal. Upper edge of last half of the spinous dorsal black, continued as a black band along the base of the soft dorsal. Grows to 18 inches, and is a firm-fleshed and wholesome fish.

The Andamans.

### Family Scorpenidæ.

Branchiostegals 5 to 7. Pseudobranchiæ. Teeth in villiform bands. A single dorsal fin in two distinct portions. Ventrals thoracic.

*MYRIODON*, *Barneville*.

Branchiostegals 7. Opercle spinate. Preopercle denticulated, with spinous teeth on the lower limb directed forwards. Villiform teeth in jaws, vomer, and palatines.



*M. waigiensis*, Quoy et Gaim.

B. vii.; D.  $1\frac{1}{2}$ ; P. 14; V. 1; A. 3; C. 16.

No spines on the head or groove below the eye. Interorbital space convex. A nasal tentacle half the diameter of the orbit. Dorsal spines strong, increasing to the fourth. Colour reddish, marbled with brown. Some dark marks radiate from the eye. All the fins spotted or banded with brown or black.

The Nicobars.

*SERASTICHTHYS*, *Gill*.

Differs from *Sebastes* in having no palatine teeth.

*S. STRONGIA*, Cuv. et Val.

B. vi.; D. 11-12  $\frac{1}{2}$ ; P. 19; V. 1; A. 3; C. 15.

Supraorbital ridge spined. Two spinate lines run posteriorly from the orbit. Two strong spines on the lower margin of preopercle, and a spiny ridge from the angle of preopercle to below the orbit. Three strong spines on preorbital, and a very strong one on the shoulder. Two tentacles above the orbit and several more about the head. Dorsal spines strong, increasing to the ninth. Colour brown, banded with darker. Fins irregularly banded in dotted lines.

The Andamans.

*SCORPENÆ*, *Artedi*.

Branchiostegals 7. Head large, with a scaleless groove on the occiput, and armed with spines and usually skinny flaps. Villiform teeth on jaws, vomer, and palatines. A single dorsal fin deeply notched between the two portions. Pectoral large. No air-vessel.

*S. HAPLODACTYLUS*, Bleeker.

B. vii.; D. 11  $\frac{1}{2}$ ; P. 5 + xii.; V. 1; A. 3; C. 15.

Interorbital space deeply concave, no groove below the eyes. Numerous spines and several fleshy tentacles about the head. A strong spine above the base of the pectoral. Dorsal spines increase to the fourth and decrease to the eleventh. Soft dorsal slightly higher than the spinous. Colour brownish black, banded and marbled with darker. Anal dark banded basally. Two vertical bands on the caudal, which is dark-margined, edged with white.

Andamans.

*SCORPENOPSIS*, *Heckel*.

Characters of *Scorpana*, but without palatine teeth.

*S. OXYCEPHALA*, Bleeker.

B. vii.; D. 11  $\frac{1}{2}$ ; P. 6 + xii.; V. 1; A. 3; C. 13.

Interorbital space deeply concave. A deep groove below the front third of the orbit. A groove across the occiput, with one anterior and two posterior spines. Three strong spines and a tentacle on the orbit. A strong turbinal spine. A tentacle to the front nostril. Preorbital ridged and spined. Opercle and temporal ridge spined. A spine above the base of the pectoral. A large tentacle at the gape, and some small ones on the preopercle and lateral line. The third dorsal spine slightly longer than the fourth. Colour reddish, clouded with brown and black spotted. Dorsal anteriorly dark banded. Fins blotched.

The Nicobars.

*PTEROIS*, *Cuvier*.

Branchiostegals 7. Head as in *Scorpana*, but without an occipital groove, and without palatine teeth. A deeply-notched dorsal fin, with 12 to 13 spines. Air-vessel large.

*P. ZEBRA*, Cuv. et Val.

B. vii.; D. 12  $\frac{1}{2}$ ; P. 17; V. 1; A.  $6\frac{3}{5}$ ; C. 14.

Interorbital space deeply concave, traversed by two low ridges, ending in a spine. Preopercle with 3 spines on its vertical border. Orbit spined and serrated. Turbinal spines present. Stellate ridges on the preorbital. A long tentacle on the orbit, and a large fleshy tentacle over the gape. Dorsal spines increase to the seventh. Caudal wedge-shaped. Body banded with narrow intermediate ones. A black blotch, white centred on the axilla. Dorsal spines annulated with black. Soft dorsal and anal black spotted. Caudal sinuously banded. Pectoral and ventral fins banded.

The Andamans.

*P. VOLITANS*, L.

Cheeb-ta-dah. Andamans.

B. vii.; D. 12  $\frac{1}{10}$   $\frac{1}{11}$ ; P. 11; V.  $\frac{1}{2}$ ; A.  $\frac{2}{3}$  -  $\frac{3}{4}$ ; C. 14.

Interorbital space deeply concave, two-ridged, and with the nape scaleless. Preopercle with 2 or 3 spines along its vertical border, and 3 more along its lower limb. Turbinal spines present. A long tentacle over the orbit, and fleshy tentacles along the lower edge of the preorbital. The first 10 dorsal spines high. Reddish, with vertical brown bands, having narrower and lighter intermediate ones. Three or four bands radiate from the eye. A black spot with white centre in the axilla. Dorsal spines annulated with black.

The Andamans.

*P. CINTRA*, Rüpp.

B. vii.; D. 11  $\frac{1}{11}$   $\frac{1}{12}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $\frac{3}{4}$ ; C. 15.

Interorbital space very concave. Orbital margin serrate, and orbital tentacle very long. Occipital and temporal ridges spinate. Several flesh tentacles on the head. The eighth and ninth dorsal spines the highest. Pectoral reaches to end of caudal or farther. Colours, a deep brown white-edged band from the eye to the end of the interopercle, another encircles the neck, and there are six more on the body, which looks as if traversed vertically by milk white bands. A black mark in the axilla. Ventrals grey. Caudal spotted. Snout pale.

The Andamans.

*APISTUS*, *Cuvier*.

Head and body rather compressed. Branchiostegals 6. No occipital groove. A mandibular barbel. A single dorsal fin. Villiform teeth in jaws, vomer, and palate. Air-vessel constricted. A cleft behind the fourth gill. Scales small.

*A. CARINATUS*, Bl. Schn.

B. vi.; D. 3  $\frac{1}{10}$   $\frac{1}{16}$ ; P. 12 + 1; V.  $\frac{1}{2}$ ; A.  $\frac{2}{3}$ ; C. 12.

Upper surface of head roughened with two lines diverging to the occiput. Preorbital and preopercle spinate. A long barbel on the mandible followed by a shorter one. The dorsal spines increase to the sixth and decrease to the fourteenth. Colour greyish on the back, rosy on the belly. Pectorals black. Appendages milk white. Dorsal diaphanous, black edged. A deep black blotch from the eighth to the fourteenth spine. Three oblique brown streaks on the soft dorsal. Upper pectoral ray white. Caudal with four black vertical bands. Anal grey, yellow margined.

The Andamans.

*GYMNAPISTUS*, *Savainson*.

Characters much as in *Apistus*, but scales rudimentary or absent.

*G. NIGER*, Cuv. et Val.

Pom-tho-cho-rogue-dah. Andamans.

B. vi.; D. 3  $\frac{1}{10}$   $\frac{9}{8}$ ; P. 10; V.  $\frac{1}{2}$ ; A.  $\frac{2}{3}$ ; C. 9.

Preorbital with a very strong sharp spine. Preopercle spinate. Dorsal web continuous, but the third and fourth spines a trifle distant. Scales absent, save as rough patches here and there. Colour brownish black, caudal yellowish white, striated with brown, with a terminal dark band, white-edged.

The Andamans.

*AMBLYPISTUS, Bleeker.*

Branchiostegals 5 or 6. Head and body strongly compressed. No occipital groove. Strong and sharp preorbital and preopercular spines. Teeth as in *Apistus*. A single dorsal. Scales rudimentary or none. Air-vessel present.

*A. TENIANOTUS, Lacép.*

B. v.; D.  $1\frac{3}{8}-1\frac{1}{2}$ ; P. 12; V.  $\frac{1}{2}$ ; A.  $\frac{3}{4}-5$ ; C. 12.

Profile over the snout almost vertical. Preorbital, preopercle and opercle spinate. Dorsal high anteriorly, its second spine highest. All the articulated fin rays branched. Colour reddish, with irregular brownish spots. A brown mark between the fifth and sixth or seventh dorsal spine.

The Andamans.

*A. MACRACANTHUS, Bleeker.*

B. vi.; D.  $1\frac{1}{2}-1\frac{1}{2}$ ; P. 12; V.  $\frac{1}{2}$ ; A.  $\frac{3}{4}$ ; C. 12.

Five spines in the preopercle and two on both the opercle and preorbital. Barrels none. Dorsal commences before the eyes, and is high anteriorly; the first three spines slightly distant from the rest, and the second highest. All the articulated fin-rays branched near their extremities. A few scattered and imbedded scales. Colour brownish black, the pectoral white bordered.

The Andamans.

*COCOTROPUS, Kaup.*

Branchiostegals 6. Head and body strongly compressed. No occipital groove. Preorbital and preopercle with a strong blunt spine. A single dorsal. Articulated fin-rays unbranched. Villiform teeth on jaws and vomer only. Scales absent.

*C. ECHINATUS, Cantor.*

B. vi.; D.  $1\frac{1}{2}$ ; P. 11; V.  $\frac{1}{2}$ ; A.  $\frac{3}{4}$ ; C. 12.

Anterior profile nearly vertical. Body and head studded with small blunt prickles. Colour buff, with five brown lines radiating from the eye. Upper edge of dorsal purple. Body brown blotched, and fins brown dotted. Two white spots on the tail.

The Andamans.

*PELOR, Cuvier et Valenciennes.*

Branchiostegals 7. Head irregular. Villiform teeth in jaws and vomer only. Scales absent. Head, body, and fins covered with skinny appendages. Dorsal spine single, its three anterior spines a little distant from the rest. Air-vessel small.

*P. DIDACTYLUM, Pall.*

B. vii.; D.  $1\frac{3}{4}-1\frac{1}{2}$ ; P. 10+11; V.  $\frac{1}{2}$ ; A. 11-12; C. 12.

Lower jaw the longer, and provided with fleshy tentacles. Interorbital space concave, and with a transverse ridge; an occipital depression and groove below the eyes. Blunt spines on orbit. Occipital and temporal ridges spinate. A turbinal spine. Second dorsal spine longest. Skinny appendages on the deeply cleft dorsal web. Colour brownish-grey, dirty-white below. Head and body with five spots. Caudal yellow, with a dark vertical band at the base, and a second across its terminal third.

The Andamans.

*Family Teuthidæ.*

Branchiostegals 5. Pseudobranchiæ well developed. Body oval and strongly compressed. A single row of cutting incisors in either jaw. Palate edentulous. One dorsal. Anal with 7 spines. Scales minute. Air-vessel present.

*TEUTHIS, Linnaeus.*

Teeth small, denticulate. Dorsal with 13 spines, and one anterior and horizontal.

*T. VIRGATA*, Cuv. et Val.

Tah-meer-dah, Andamans. Ngā-pron-ka, Arakan (generic).

B. v.; D.  $1\frac{3}{5}$ ; P. 17; V.  $\frac{2}{3}$ ; A.  $\frac{1}{2}$ ; C. 17.

Dorsal spines strong, increasing to the fifth and decreasing from the seventh. Colour, some oblique blue lines and spots on the snout. Upper two-thirds of body coppery yellow, covered with round blue spots. A brown blue-edged band descends from before the dorsal through the eye to below the jaws, and a second from the sixth and seventh dorsal spines to the base of the pectoral. Fins yellowish.

The Andamans.

*T. JAVA*, L.

B. v.; D.  $1\frac{3}{5}$ ; P. 18; V.  $\frac{2}{3}$ ; A.  $\frac{7}{9}$ ; C. 19.

Dorsal spines strong, increasing to the fourth, and occupying five-sevenths of the entire fin. Head, back, and sides dark neutral tint, paler on the belly, and covered with pale rounded spots, elongated on the sides and belly. Sometimes the cheeks are reticulated. Fins immaculate.

The Andamans.

*T. VERMICULATA*, Cuv. et Val.

Chow-lud-dah. Andamans.

B. v.; D.  $1\frac{1}{2}$ ; P. 16; V.  $\frac{2}{3}$ ; A.  $\frac{7}{9}$ ; C. 17.

Dorsal spines strong, the first three highest. Back bluish green, sides light brown, belly white. The whole head and body lined with undulating bluish lines, broadest on the belly. Caudal fin brown-lined.

The Andamans.

*T. MARMORATA*, Quoy et Gaim.

B. v.; D.  $1\frac{3}{5}$ ; P. 18; V.  $\frac{2}{3}$ ; A.  $\frac{7}{9}$ ; C. 17.

Dorsal spines moderate, increasing to the fourth and decreasing from the seventh. Brownish, back and head covered with vermiculate blue lines, which become sinuously longitudinal on the sides. Pectorals yellow. Other fins with sinuous brown lines.

The Andamans.

*T. CONCATENATA*, Cuv. et Val.

Thar-oar-dah. Andamans.

B. v.; D.  $1\frac{3}{5}$ ; P. 18; V.  $\frac{2}{3}$ ; A.  $\frac{7}{9}$ ; C. 18.

Dorsal profile more convex than abdominal. A broad shallow interorbital groove, laterally ridged. Dorsal spines increase to the fifth, and decrease to the twelfth. Scales larger than ordinary. Colour dark greyish-brown, covered with light orange spots, smaller on the belly. A broad blue band from the orbit to the gape, and another passes along the preopercle. Tail brown-spotted.

The Andamans.

*T. MARGARITIFERA*, Cuv. et Val.

B. v.; D.  $1\frac{3}{5}$ ; P. 17; V.  $\frac{2}{3}$ ; A.  $\frac{7}{9}$ ; C. 17.

Dorsal and abdominal profiles similar. Dorsal spines increase to the fifth and decrease to the thirteenth. Upper caudal lobe longest. Colour brownish olive, with small blue spots on the back and sides. A dark oval shoulder mark, and dark lines on spinous dorsal. Soft dorsal and anal brown-spotted.

The Andamans.

*T. ORAMIN*, Bl. Schn.

*T. albopunctata*, Tem. et Schl.

B. v.; D.  $1\frac{3}{5}$ ; P. 16; V.  $\frac{2}{3}$ ; A.  $\frac{7}{9}$ ; C. 17.

Dorsal spines increase to the fourth and decrease to the thirteenth. Scales very minute. Colour olivaceous, with indistinct longitudinal stripes on the body. Belly

silvery. A round black shoulder spot and a black spot over the eye. Back with numerous pearly-white spots. Dorsal fin brown-spotted. Caudal vertically barred and black-edged. Anal black-spotted. Pectorals orange.

The Andamans.

*Family Berycidae.*

Branchiostegals from 4 to 8. Pseudobranchiae present. Form oblong or rather elevated and compressed. Head with large muciferous cavities. Teeth more or less villiform in both jaws. Dorsal, when single, having the spinous portion less than the soft, or with isolated spines in front.

*MYRIPHISTIS, Cuvier.*

Branchiostegals 7 or 8. Teeth villiform on jaws, vomer, and palatines. Two dorsal fins. Tail forked. Air-vessel contracted near its centre.

*M. MURDJAN, Forsk.*

*Sparus, sullawaroo-kuntze, Russell.*

B. viii.; D. 10<sub>14</sub><sup>3</sup><sub>10</sub>; P. 15; V.  $\frac{1}{2}$ ; A. 12<sup>1</sup><sub>11</sub>; C. 19.

Lower jaw slightly the longer, with a rough wart on either side of the symphysis. Mandible furrowed by 10 or 12 grooves. Upper surface of head roughened by 3 or 4 raised lines, which divide and subdivide, each ending in a small spine. Dorsal spines increase to the third, the three next being equal to it. Colour roseate. Gill openings deep brownish black or like coagulated blood. A dark mark in the axilla. A dark vertical band through the eye. Dorsal, caudal, anal and ventral fins edged with milk-white.

The Andamans.

*HOLOCENTRUM, Artedi.*

Branchiostegals 8. Villiform teeth on jaws, vomer, and palatines. Two dorsal fins. Tail forked. Air-vessel oval and simple.

*H. ANDAMANENSE, Day.*

B. viii.; D. 11·15; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 22.

Preopercle denticulated, with a large fluted spine at its angle. Third to fifth dorsal spines highest. Colour uniform rosy scarlet.

The Andamans.

*Family Polynemidae.*

Branchiostegals 7. Pseudobranchiae. Body oblong. Eyes large, more or less covered by an adipose membrane. Mouth on the lower side of a prominent snout. Two dorsal fins. Seven free and articulated appendages below the pectoral. Air-vessel variable in form, present or not.

*POLYNEMUS, Linnæus.*

Teeth villiform on the jaws, palatines, vomer and pterygoid bones.

*A. Air-vessel none.*

*P. PARADISEUS, L.*

Ngā-pong-na. The mangoe-fish.

B. vii.; D. 7<sub>17</sub><sup>1</sup><sub>17</sub>; P. 15 + vii.; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 19.

Snout overhangs the mouth. Seven free rays below the pectoral, the three upper ones being the longest, and about twice the length of the fish. Colour golden, with a tinge of grey on the back and fins. Grows to 10 inches.

Coasts of India and Burma, entering rivers to spawn during the S.W. monsoon and the cold months.

It is highly esteemed as a delicacy, especially the roes, and called 'mangoe fish' by Europeans, or 'tapsi mäch,' of which name Buchanan observes: "Those

who officiate in the temple of *S'ib* are called *Tapasi* in the vulgar dialect, and *Tapasiri* in Sangseritta, that is to say, penitents. They ought not to shave, on which account a fish called *Mangoe* fish by the English in Calcutta, which has long fibres proceeding from near its head, is called by the same name." So '*tapasi*' is a vulgar corruption of '*Tapasiri*'?

*P. TETRADACTYLUS*, Shaw.

Ngā-ta-yaw. (To bro-dah. Andamans.)

B. vii.; D. 8  $\frac{1}{1-1\frac{1}{2}}$ ; P. 17 + iv.; V.  $\frac{1}{3}$ ; A.  $\frac{2}{1\frac{1}{2}-1\frac{3}{4}}$ ; C. 17.

The four free pectoral rays reach nearly to the vent. Colour silvery green, becoming yellowish-white on the sides and belly. Dorsal and caudal greyish, minutely black-dotted. Ventral and anal pale orange in their outer halves. Pectoral filaments white. A dark mark on the opercle. Grows to over 6 feet and over 300 lbs., and is excellent eating.

Coasts of India and Burma, ascending rivers freely.

#### B. *Air-vessel present.*

*P. INDICUS*, Shaw.

*P. sele*, Ham. Buch.

Lukwah, Arakan. Ka-koo-yan, Burma. (Kwai-yeng, Tavoy.)

B. vii.; D. 8  $\frac{1}{1-1\frac{1}{4}}$ ; P. 15 + v.; V.  $\frac{1}{3}$ ; A.  $\frac{2}{1\frac{1}{4}-1\frac{1}{2}}$ ; C. 17.

Five free pectoral rays, the longest reaching nearly to the anal. Caudal deeply lined with usually filamentous ends. Colour, back purplish-black, belly silvery-white dashed with gold. Dorsals and anal stained with black. Grows to 4 feet, but is rarely seen over 20 lbs. A large fish yields two ounces of rough isinglass. Air-vessel oval and thick, occupying the whole length of the belly, and posteriorly prolonged among the caudal muscles.

Coasts and embouchures of large rivers of India and Burma.

*P. PLEBEIUS*, Gmel.

B. vii.; D. 8  $\frac{1}{1\frac{1}{3}}$ ; P. 17 + v.; V.  $\frac{1}{3}$ ; A.  $\frac{2}{1\frac{1}{3}}$ ; C. 17.

Five free pectoral rays, the longest reaches just beyond the ventral. Colour golden, greyish along the back. Dark lines along each row of scales. Anal greyish. Ventral white internally, externally grey. Fins grey-edged. Air-vessel narrow, elongate, and simple.

Coasts of India and Burma.

It is important to observe that the only species of *Polynemus* which yield isinglass (air-vessels) are those possessed of 5 free pectoral rays or filaments.

#### Family *Sciænidæ*.

Branchiostegals 7. Muciferous system on the head well developed. Teeth in villiform bands, but neither cutting nor molar-like teeth. Two dorsal fins, the second the most developed.

*SCLENA*, Cuvier.

Teeth villiform, with an outer enlarged row in the premaxillaries, and sometimes an inner enlarged row in the mandible. No distinct canines. Anterior dorsal with 9 or 10 spines, posterior with 23 to 32 rays.

#### A. *An enlarged inner row of teeth in the mandible.*

*S. MILES*, Lacép.

*Corrina soldado*.

Ka-loung-boung.

B. vii.; D. 9-10  $\frac{1}{2-1\frac{1}{2}}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{2}{2}$ ; C. 17.

Five pores on the inferior surface of the mandible. Snout not overhanging.

Dorsal spines weak, and twice as long as the rays. Caudal wedge-shaped. Colour greyish, darkened with green, on the back, and white on the belly. Vertical white. Outer edges of fins sometimes dark. Grows to 2 feet in length.

Coasts of India and Burma.

*S. coitor*, Ham. Buch.

*Johnius coitor*.

Ngā-ta-dum, and Ngā-pok-theng.

B. vii.; D.  $10 \frac{1}{2} - \frac{2}{5}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{2}{7}$ ; C. 17.

One central and two lateral orifices below the symphysis of the mandible. Snout prominent and swollen superiorly; upper jaw somewhat the longer. Dorsal spines weak, the second to the fourth longest. Caudal wedge-shaped. Silvery shot with gold and purple. Upper half of first dorsal blackish. Soft dorsal, caudal and anal dark externally, and a dark basal band on the anal. Grows to a foot.

Inhabits the larger rivers of India and Burma, descending to the sea at certain seasons.

*S. diacanthus*, Lacép.

*Johnius diacanthus* and *chaptis*.

B. vii.; D.  $10 \frac{1}{2} - \frac{1}{4}$ ; P. 18-19; V.  $\frac{1}{2}$ ; A.  $\frac{2}{7}$ ; C. 17.

Upper jaw a little the longer. Five open pores under the symphysis of the mandible. Dorsal spines weak, increasing to the third and fourth. Caudal wedge-shaped. Brownish grey, shot with silver along the back, and fading below the lateral line to silvery grey. Head glossed with purple. Fins yellowish, with black dots. Eyes golden. Grows to 5 feet in length.

Burma, ascending rivers.

This is one of the fishes which Mason describes as yielding isinglass.

*S. aneus*, Bloch.

Chal-burn-dah. Andamans.

B. vii.; D.  $10 \frac{1}{2} - \frac{1}{4}$ ; P. 18; V.  $\frac{1}{2}$ ; A.  $\frac{2}{7}$ ; C. 17.

Snout not overhanging, and with a small pore on either side just above the free edge of the skin. Mandible slightly advanced, with a small open pore on either side of the symphysis. Caudal squarish. Colour silvery-grey, white on the belly. First dorsal black-tipped, or stained with grey. Second dorsal greyish. Pectoral, ventral, and anal fins yellowish. Air-vessel oval, extending the whole length of the belly, but yields an inferior isinglass.

The Andamans, where not rare.

B. *No row of enlarged teeth in the mandible.*

*S. glaucus*, Day.

B. vii.; D.  $10 \frac{1}{2} - \frac{1}{5}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $\frac{2}{7}$ ; C. 17.

Snout rounded and overhanging. Snout with three pores across its base, and five along its free border, which has a distinct lateral lobe. Five open pores below the mandibular symphysis. Caudal rounded. Colour greyish-green on the back, silvery below, and fine brown spots everywhere. A diffused bluish blotch on the opercles, a dark spot at the base of the pectoral. First dorsal black, second dorsal, caudal, and last half of pectoral profusely clouded with brown spots. Scales ctenoid, except on mouth and cheeks. Grows to a large size.

The Andamans.

*S. carutta*, Bloch.

B. vii.; D.  $10 \frac{1}{2} - \frac{1}{5}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{2}{7}$ ; C. 17.

Colour purplish brown, becoming golden below, paler along the lateral line. Head glossed with purple. Scales cycloid, except a few between the pectoral fin and lateral line. Grows to nearly a foot.

These two species closely resemble one another, save in the character of their scales. The air-vessels of *S. glaucus* and *S. sinu* are largely prepared on the West coast of India and Sind, where they are called 'soor' fish, which name is written 'seer' by McClelland, who erroneously refers it to a *Polynemus*, whereas, according to Day, it refers to *S. sinu* or *S. glaucus*. 'Soor' means 'pig.'

SCLENOIDES, *Blyth*.

Eyes small. An outer row of distinct curved conical teeth in the upper jaw, becoming canine-like anteriorly, and a similar inner row in the lower jaw. Villiform teeth interiorly in the upper and exteriorly in the lower jaw. Air-vessel generally with a horn-like process on either side.

*S. PAMA*, Ham. Buch.

Ngā-pyek. Called 'whiting' by Europeans in Calcutta.

B. vii.; D.  $10 \frac{1}{4} + \frac{1}{4} + 3$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{2}{7}$ ; C. 17.

Snout not much swollen, with two open pores anteriorly and two more on the free edge of the skin. Lower jaw slightly shorter, and with a small symphyseal open pore. Dorsal spines weak, with filamentous ends, the third and fourth longest. Caudal wedge-shaped, its central rays much the longest. Colour brown, lighter below. Head shot with gold and purple. Fins yellowish. The upper half of dorsal and caudal grey. Grows to 5 feet in length.

Coasts of India and Burma.

*S. BIAURITUS*, Cantor.

*Otolithus biauritus*.

B. vii.; D.  $9 \frac{1}{2} + \frac{1}{2} + 3$ ; P. 19; V.  $\frac{1}{3}$ ; A.  $\frac{2}{7}$ ; C. 17.

Upper jaw overlaps the lower. Five open pores along the free edge of the skin of the snout. Four small open pores below the mandible. Dorsal spines weak, the fourth highest. Caudal wedge-shaped. Colour light brown above, tinged with gold on the belly; head shot with purple. Grows to  $3\frac{1}{2}$  feet or more.

Indian seas.

According to Cantor this fish yields an isinglass highly esteemed by the Chinese.

To this family belongs the genus *Pogonias*, one or more species of which possess the power of emitting musical sounds. Musical fish, so called, have been noticed in Burma by the Rev. C. Parish, but the species has not been identified, and if one species possessing pharyngeal teeth makes those sounds, it is more than likely that several species possess the power. For further remarks on this subject see Appendix (Musical Fish).

Here follows the family of Xiphiidae or Sword-fishes. These fish grow to between 5 and 6 feet, and are armed with a pointed bony rostrum or 'sword' with which they sometimes transfix the sides of ships, driving their sword through the copper sheathing and the wooden planks beneath. They are said to attack whales, and it seems not unlikely that the Xiphias rushes at a ship supposing it to be a helpless cetacean, and does not discover its error till it has got the worst of the encounter and lost its snout in the shock.

### Family Trichiuridæ.

Branchiostegals 7 or 8. Body elongated and compressed. Teeth in jaws or palate, several being strong and conical. Scales none or rudimentary. Air-vessel present. No prominent papilla behind the vent.

TRICHIURUS, *Linnaeus*.

Branchiostegals 7. Body very elongate, strongly compressed, ribbon-shaped, tapering to a fin-less point at the tail. Teeth in jaw and palatines, those in the maxillaries being arched and very strong, whilst the lateral ones are lancet shaped. A single dorsal the whole length of the back. Scales none. Air-vessel present.



T. HAUMELA, Forsk.

Ngā-ta-khwōn-kha. (Pa-pa-dah, Andamans.)

B. vii.; D. 127-133; P. 11.

Lower jaw considerably the longer. Two pairs of large curved and barbed canines in the upper jaw, and a pair of similar but smaller ones over the mandibular symphysis, and in advance of the snout when the mouth is closed. The anal fin in the shape of small spines, often concealed. Colour grey on the back, silvery on sides and belly. Fins pale yellow. The upper half of the dorsal dark. Grows to 2 feet or so.

Jerdon says this species is delicate eating when fresh.

Cantor describes it as giving off, at certain seasons, a vivid phosphoric light.

The Andamans.

### Family Acanthuridæ.

Branchiostegals from 4 to 7. Pseudobranchiæ. Body oblong, or elevated and compressed. Teeth on both jaws in a single compressed row. Palate edentulous. A single dorsal fin. Scales minute. The side of the tail in adults armed with one or more bony plates or spines. Air-vessel present.

ACANTHURUS, *Blainville*.

Branchiostegals 5. A movable spine exists in a groove on the side of the free portion of the tail just below the lateral line.

A. *Broad teeth fixed in the jaws. 8 or 9 dorsal spines.*

A. LINEATUS, L.

B. v.; D.  $\frac{8}{28}-\frac{9}{31}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{3}{27}$ ; C. 17.

Six or seven lobed incisors on either side of upper jaw. Caudal spine lancet-shaped, with a posterior process. Colour, head, and upper two-thirds of body canary yellow, traversed by nine or ten oblique blue bands, from the head to the back and tail. Lower third of body reddish-grey. Other blue bands pass upwards and backwards, from the eye to the body bands. Upper ray of pectoral blue, and inside it a short white line, and an arched white band on the lower half of the pectoral on its lower side. Outer ray of ventral blue, its inner ones red. Caudal with a central semilunar blue band and blue margin. Grows to about 18 inches.

The Andamans.

A. TRIOSTEGUS, L.

B. v.; D.  $\frac{8}{28}-\frac{9}{31}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{3}{26}-\frac{3}{27}$ ; C. 17.

Eight lobate incisors on either side of upper jaw, and 9 or 10 on either side of lower. Caudal spine with a sharp posterior process. Colour greenish, with a brownish tinge on the back. A vertical dark band along the snout, one through the orbit, four down the body, and two blotches at the base of tail, one above, the other below the lateral line. Fins darkish.

The Andamans, where common.

B. *Setiform movable teeth dilated at their extremities. 8 dorsal spines.*

A. STRIGOSUS, Bennett.

B. v.; D.  $\frac{8}{28}-\frac{9}{30}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{3}{26}-\frac{3}{27}$ ; C. 17.

Teeth setiform, movable, and with their outer third dilated and spoon-shaped, with three deep clefts in each. 21 on the upper and 20 on the lower jaw. Caudal spine with a sharp posterior process. Colour, body horizontally lined with narrow bluish lines on a yellow ground. Many red spots on the head, especially round the eyes. Dorsal and anal fins lined, and a light median vertical band on the caudal.

The Andamans.

*c. Broad teeth fixed in the jaws. 1 to 4 dorsal spines.*

A. VELIFER, Bloch.

B. v.; D.  $\frac{3}{2}$  -  $\frac{1}{2}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{3}{2}$  -  $\frac{1}{2}$ ; C. 17.

Six lobate incisors on each side of the upper jaw. Dorsal very elevated, fourth dorsal ray highest. Scales rudimentary. Colour greyish, with nine vertical white-edged bands from the back to the belly. Head sometimes white-spotted. Four curved blue or white bands on the dorsal, six on the anal and four on the caudal. Caudal pale-spotted. Grows to over 16 inches.

The Andamans.

### Family Carangidæ.

CARANX, Lacépède.

Branchiostegals 7. Pseudobranchiæ. Dentition feeble. Two dorsal fins, the first bearing 8 weak spines and a recumbent spine directed forwards in front of it. Scales minute. Lateral line curved anteriorly, and posteriorly straight, and armed with large plate-like scales. Air-vessel bifurcate posteriorly.

A. *Teeth on the palate. No finlets.*

C. MELAMPYGUS, Cuv. et Val.

B. vii.; D. 8  $\frac{1}{2}$  -  $\frac{1}{2}$ ; P. 22; V.  $\frac{1}{2}$ ; A. 2  $\frac{1}{2}$  -  $\frac{1}{2}$ ; C. 19.

Lower jaw rather the longer. An outer row of enlarged teeth in the upper jaw. Straight portion of lateral line with keeled scales, the largest  $\frac{1}{2}$  the height of body, and 34 to 36 in number.<sup>1</sup> Colour greenish gold along the back, silvery along the belly. Sometimes the body is black-spotted.

The Andamans.

C. CRUMENOPHTHALMUS, Bloch.

B. vii.; D. 8  $\frac{1}{2}$  -  $\frac{1}{2}$ ; P. 21; V.  $\frac{1}{2}$ ; A. 2  $\frac{1}{2}$  -  $\frac{1}{2}$ ; C. 21.

A single row of teeth in both jaws, some also on the vomer, palatines and tongue. Lateral line a very flat curve, with keeled scales behind the centre of the dorsal, and which are strongest opposite the termination of the dorsal, the largest equal  $\frac{1}{2}$  the height of body. Colour silvery above, golden below. Sometimes an opercular spot. Caudal black-tipped. Grows to a foot or more.

The Andamans.

C. BOOPS, Cuv. et Val.

B. vii.; D. 8  $\frac{1}{2}$  -  $\frac{1}{2}$ ; P. 19; V.  $\frac{1}{2}$ ; A. 2  $\frac{1}{2}$  -  $\frac{1}{2}$ ; C. 17.

Lower jaw and teeth as in *crumenophthalmus*. Plates on lateral lines commence from sixth dorsal spine, and at their broadest equal  $\frac{1}{2}$  the height of the body, and are 46 in number. Colour silvery, darker on the back and shot with gold on the belly. A small opercular spot. Dorsal and caudal dark-spotted.

The Andamans.

C. AFFINIS, Rüpp.

B. vii.; D. 7·8  $\frac{1}{2}$  -  $\frac{1}{2}$ ; P. 24; V.  $\frac{1}{2}$ ; A. 2  $\frac{1}{2}$  -  $\frac{1}{2}$ ; C. 17.

Lower jaw slightly projects. Teeth villiform in more than one row in either jaw near the symphysis, laterally in a single row of moderately large ones. Teeth also on the vomer, palatines, and tongue. Lateral line with a long irregular curve, which straightens below the sixth dorsal ray; the plates commence from the fifth to the eighth scale of the straight portion, 42 to 47 in number (the largest being  $\frac{1}{2}$  of height of body). Colour silvery on the back, golden on the belly. A series of short vertical bands as wide as the interspaces crosses the lateral line along its entire length. A black shoulder spot extending to the opercle. Fins yellow. Anal white-edged. Second dorsal anteriorly white, and posteriorly dark-tipped.

The Andamans.

<sup>1</sup> The number of scales given on the lateral line refers to the keeled scales only.

*C. COMPRESSUS*, Day.

B. vii.; D.  $8 \frac{1}{25} \frac{1}{24}$ ; P. 21; V.  $\frac{1}{5}$ ; A.  $2 \frac{1}{16} \frac{1}{20}$ ; C. 21.

Lower jaw the longer. Teeth villiform in both jaws, and on vomer, palate, and tongue. Lateral line a very gradual curve. The keeled scales are most developed on the free portion of the tail, where the largest equal  $\frac{1}{8}$  of height of body, and are 13 in number. Colour silvery, with a minute opercular spot. Vertical margin of preopercle dark.

The Andamans.

*C. ORLONGUS*, Cuv. et Val.

Ro-thul-dah. Andamans.

B. vii.; D.  $8 \frac{1}{21} \frac{1}{22}$ ; P. 21; V.  $\frac{1}{5}$ ; A.  $2 \frac{1}{18} \frac{1}{19}$ ; C. 18.

Lower jaw the longer. Teeth in a narrow villiform band in the upper jaw or in two rows, with the outer slightly enlarged. In the lower in a single row, except in front, where they are largest, and have a few villiform teeth behind them. Teeth also on vomer, palatines, and tongue. Keeled scales over the whole of the straight portion of the lateral line, the largest equal  $\frac{1}{4}$  of the height of the body, 34 to 40 in number. Colour of adults olive above, white below. Fins yellow. Caudal orange, with its terminal half black, but white-tipped.

The Andamans.

*C. ARMATUS*, Forsk.

B. vii.; D.  $6.8 \frac{1}{26} \frac{1}{21}$ ; P. 21; V.  $\frac{1}{5}$ ; A.  $2 \frac{1}{16} \frac{1}{17}$ ; C. 19.

Lower jaw the longer. Teeth villiform in both jaws, with an outer somewhat enlarged row on the premaxillaries; they are also present on the vomer, palatines and tongue. Lateral line makes a low curve and straightens below the centre of the second dorsal. Keeled plates commence in the last half of the straight portion, but are small and 20 in number. Colour, top of head and back bluish-green, sides of the head and body golden with purple reflexions. A spot on the opercle. First dorsal black, second and anal yellowish, with dark edges. The young vertically banded.

The Andamans.

B. *No teeth on the palate. No finlets.*

*C. NIGRIPINNIS*.

B. vii.; D.  $7.8 \frac{1}{25} \frac{1}{22}$ ; P. 23; V.  $\frac{1}{5}$ ; A.  $2 \frac{1}{20} \frac{1}{21}$ ; C. 19.

Lower jaw somewhat the longer. Teeth in both jaws of equal size in a single row. A few on the tongue, but none on vomer or palatines. Lateral line straightens behind the fourth dorsal ray. The largest scales on it equal  $\frac{1}{2}$  the height of the body and they number 55 to 60. Colour silvery, shot with gold. First dorsal black. Anal white-edged. A dark band along the second dorsal, with its upper anterior corner white.

The Andamans.

*CUORINEMUS*, *Cuvier et Valenciennes*.

Branchiostegals 7 or 8. Pseudobranchie. Teeth in jaws, vomer, palatines, and tongue. Two dorsal fins, with an immovable procumbent spine in front. First dorsal composed of a few free spines. Posterior dorsal and anal rays detached or nearly so. Dorsal scales mostly lanceolate. Air-vessel bifurcate posteriorly.

*C. TOLU*, Russell.

B. viii.; D.  $7 \frac{1}{14} \frac{1}{20}$ ; P. 20; V.  $\frac{1}{5}$ ; A.  $2 \frac{1}{17} \frac{1}{18}$ ; C. 19.

Teeth comparatively large, in a single in the upper jaw and in two rows in the lower, the outer one directed somewhat outwards, and a pair of canine-like teeth on either side of the mandibular symphysis. The last 8 or 10 rays of both soft dorsal and caudal, semidetached. Colour of back greenish, shot with blue. Belly silvery. Six or eight indistinct vertical spots along the lateral line. Grows to eighteen inches.

The Andamans.

C. LYSAN, Forsk.

The 'Madagascar Mackerel.' Ngā-pyek.

B. viii.; D.  $7 \frac{1}{10} \frac{1}{20}$ ; P. 19; V.  $\frac{1}{3}$ ; A.  $2 \frac{1}{17} \frac{1}{18}$ ; C. 19.

Teeth anteriorly in two rows, posteriorly in one row in the premaxillaries. In the lower jaw in two rows. Some of the anterior teeth in both jaws rather enlarged. Also teeth in a triangular spot on the vomer, and in a pyriform band on the palatines; also on the tongue. The anterior part of the soft dorsal and anal elevated, the last 8 or 10 rays semidetached. Colour, six or eight large round grey spots like finger marks on the side. Summit of soft dorsal black.

Tavoy coast.

Mason says he has measured these fish over  $2\frac{1}{2}$  feet.

PSETIUS, *Cuvier et Valenciennes*.

Branchiostegals 6. Pseudobranchiæ. Body much compressed and elevated. Teeth villiform in jaws, vomer, palatine, and tongue. A single dorsal fin with 7 to 8 spines. Ventrals rudimentary. Scales small. Air-vessel bifurcate posteriorly.

P. ARGENTEUS, L.

Ngā-poo-zwōn. (Oo-chra-dah. Andamans.)

B. vi.; D.  $\frac{1}{28} \frac{1}{30}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{3}{28} \frac{3}{30}$ ; C. 17.

Ventrals placed close together like two spines, the rays being minute. Colour silvery, with purplish reflexions, especially about the anal fin. The back yellowish green, turning after death to plumbeous. A black band from the nape to the eye. A second from the first three dorsal spines to the opercle. Dorsal and anal stained black in part. Caudal yellow, margined behind with black. Grows to 7 inches or more.

The Andamans.

PLATAX, *Cuvier et Valenciennes*.

Branchiostegals 6. Pseudobranchiæ. Body compressed and much elevated. Teeth setiform, trilobed at their summits; some present on the vomer. A single dorsal fin with 3 to 7 spines, which are nearly hidden. Ventrals well developed. Air-vessel simple.

P. VESPERTILIO, Bloch.

B. vi.; D.  $\frac{6}{30} \frac{6}{37}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{3}{28} \frac{3}{28}$ ; C. 17.

Dorsal anteriorly rounded and longer than its base. Ventral extends to the middle of the anal. Anal  $\frac{1}{2}$  as long as the dorsal. Colour brownish, fins black, and last  $\frac{2}{3}$  of pectoral yellow. In the young there is a narrow vertical ocular band, a second curved one descending behind the base of the pectoral, a third in front of the tail, and a fourth at its base. The allied species *P. teira* grows to 20 inches and is excellent eating, as is the present one probably.

The Andamans.

EGULA, *Cuvier et Valenciennes*.

Branchiostegals 5 to 6. Pseudobranchiæ. Body oblong or elevated and strongly compressed. Mouth very protractile. Minute teeth of equal size in the jaws. Palate edentulous. A single dorsal with 8 to 10 spines and 15 to 17 rays. Air-vessel two-horned anteriorly.

E. EDENTULA, Bloch.

Ngā-pi-mā. Burma.

B. v.; D.  $\frac{1}{15} \frac{1}{16}$ ; P. 20; V.  $\frac{1}{2}$ ; A.  $\frac{3}{17}$ ; C. 17.

Supraorbital edge serrated. Chest without scales. Mandible very concave. Second dorsal spine arched and compressed. The third and fourth spines anteriorly serrated on their lower portion. Colour silvery, greyish along the lateral line. Fine vertical lines from the back down the sides. The soft dorsal greyish on its upper edge. Base of pectoral grey. Grows to over 8 inches.

Burma (ascending tidal rivers).

*E. Blochi*, Cuv. et Val.

B. v.; D.  $\frac{1}{16}$ ; P. 18; V.  $\frac{1}{1}$ ; A.  $\frac{1}{17}$ ; C. 17.

Supraorbital serrated. Chest scaled. Second dorsal spine longest, third and fourth serrated anteriorly below. Colour silvery, with a dark blotch over the nape, and a black mark between the third and sixth dorsal spines. Vertical zigzag yellow lines during life on the back and sides. Base of pectoral dark behind.

Akyab.

*E. brevirostris*, Cuv. et Val.

B. v.; D.  $\frac{1}{16}$ ; P. 18; V.  $\frac{1}{1}$ ; A.  $\frac{1}{17}$ ; C. 17.

Supraorbital edge serrated. Chest scaleless. Dorsal spines strong and compressed, the third and fourth strongly serrated over their lower half and quarter respectively. Spinous dorsal with a black blotch from the third to the seventh spines. A brown blotch on the nape. Pectoral black at its base posteriorly. A narrow yellow band from above the eye to the centre of the tail.

*E. insidiatrix*, Bloch.

B. v.; D.  $\frac{1}{16}$ - $\frac{1}{17}$ ; P. 18; V.  $\frac{1}{1}$ ; A.  $\frac{1}{17}$ ; C. 17.

Supraorbital edge finely serrated. Chest scaled. Dorsal spines weak. The first minute, the second, third, and fourth subequal. Colour, back bluish silver, belly whitish silver, the whole slightly glossed with gold. A dark mark in the axilla, and sometimes a black streak from the eye to the throat, which meets its fellow. Three or four horizontal lines of bronzy black spots forming vertical bands along the upper half of the body. Spinous dorsal tipped with black. Ventral white. Pectoral yellow. Caudal yellowish, stained at the end with brown.

Akyab and coast of Burma, ascending tidal rivers.

*E. reoxiers*, Ham. Buch.

Pyn-leh-ngā-zyn-zut, or Pyn-leh-ngā-hpyu-theh.

B. v.; D.  $\frac{1}{16}$ ; P. 18; V.  $\frac{1}{1}$ ; A.  $\frac{1}{17}$ ; C. 17.

Supraorbital edge serrated. The second dorsal spine longest. Scales much (2 or 3 times) larger than in *E. insidiatrix*, but deciduous and often wanting. Colours much as in the last.

Coast of Burma. This is oftener captured in tidal rivers and estuaries than the last.

*Gizza*, *Ruppell*.

Resembles *Equula*, but possesses a pair of upper canine-like teeth.

*G. mixta*, Bloch.

B. v.; D.  $\frac{1}{16}$ ; P. 17; V.  $\frac{1}{1}$ ; A.  $\frac{1}{17}$ ; C. 19.

Supraorbital edge serrated. A row of pointed teeth in the premaxillaries and a pair of canine-like ones at the symphysis. In the mandible, villiform teeth with an outer row of large conical ones. Colour silvery, with irregular bluish or yellowish lines descending over the back. The axilla black.

The Andamans.

To this family, Carangidæ, belong the curious fishes known to seamen as pilot-fish (*Naucrates*), several of which may be frequently seen in close attendance on sharks when swimming round a vessel. Why the 'pilot fish' should thus accompany the shark is not known.

### Family Stromateidæ.

Branchiostegals 5 to 7. Pseudobranchiæ. Barbed teeth extend into the œsophagus. The long dorsal fin without spines (or rudimentary ones only).

*Silomateus, Artedi.*

(Pomfrets.)

Teeth small, in a single row in the jaws. Palate and tongue edentulous. Oesophagus armed with numerous barbed teeth. A single long dorsal and anal fin, with rudimentary spines anteriorly. Ventrals if present thoracic. Air-vessel absent.

*S. NIGER*, Bloch.

Ngā-pa-moung. The "black pomfret." (Ko-lig-dah. Andamans.)

B. vii.; D.  $\frac{5}{42} \frac{5}{44}$ ; A.  $\frac{3}{35} \frac{3}{39}$ ; C. 19.

The lower jaw longer. Ventral fins in the young only. The last portion of lateral line keeled as in *Caranx*; colour deep brown, with blue reflexions. Cheeks, opercles, and belly pale or brownish neutral. Dorsal and anal greyish brown, blackish towards the margin. Pectorals and caudal brownish, edged with black. Iris brownish blue (in the young grey). Dorsal and anal fins black. Tail yellow, with three brown cross bands.

Grows to two feet, and is excellent eating.

The Andamans.

*S. SINENSIS*, Euphrasin.

Ngā-mu. The "white pomfret."

B. vi.; D.  $\frac{0}{43} \frac{0}{40}$ ; P. 25; A.  $\frac{0}{39} \frac{0}{42}$ ; C. 19.

The lower jaw longer. No ventral fins, even in the young. No keeled scales on the lateral line. Colour above, deep neutral tint; below, brownish grey with metallic reflexions, and silvery on the belly. Body dotted with brown spots, the larger ones with a central silvery dot. Fins silvery grey, dark-margined. Iris copper-coloured, and brown-dotted.

*S. CINEREUS*, Bleeker.

The "grey pomfret."

B. vii.; D.  $5.9 \frac{1}{38} \frac{1}{43}$ ; P. 27; A.  $5.6 \frac{1}{32} \frac{1}{41}$ ; C. 19.

Snout projects. Lower caudal lobe much the longer. Colour above, greyish neutral tint with purplish reflexions; below, white, minutely black-dotted, as are the dorsal and anal. Iris silvery. Grows to over a foot, and is the most highly esteemed for food of any.

Here follows the family of Coryphænidæ or Dolphins, comprising the genera *Coryphæna* and *Mene*, which inhabit the Eastern seas.

*Family Scombridæ.*

Branchiostegals 7 or 8. Pseudobranchiæ. Two dorsal fins. The infraorbital bones do not articulate with the preopercle. Scales, if present, small.

*Scomber, Artedi.*

Eyes with adipose eyelids. Behind the dorsal and anal fins 5 or 6 finlets. Ventrals thoracic. Two slight keels on either side of the root of the caudal.

*S. MICROLEPIDOTUS*, Rüpp.

Ngā-young-gyi. (Look-wah-dah. Andamans.)

B. vi.; D.  $8.10 \frac{1}{41} + v. vi.$ ; P. 21; V.  $\frac{1}{1}$ ; A.  $\frac{1}{41} + v. vi.$ ; C. 24.

Lower jaws slightly the longer. Teeth minute in both jaws, in the upper disappearing with age except near the symphysis, where they are usually persistent. None on vomer or palate. Dorsal spines weak and receivable into a groove. The second to the eighth subequal. Post-dorsal and post-anal finlets opposite and similar. Colour, back greenish, sides and belly iridescent. A row of 16 spots along the back, close to the dorsal fin. Head spotted, sides shot with bluish purple. Caudal and

pectoral bright yellow. Dorsal yellowish, tipped with black. Ventral and anal finely dotted with black. In large specimens of 12 inches from the Andamans there are 5 to 8 longitudinal bands, the uppermost broken up into spots, and usually a golden band along the lateral line and two more below it. Grows to 10 inches on the coast—or, if the Andaman specimens are the same species, to 12 or more.

*S. BRACHYSOMA*, Bleeker.

B. vii.; D.  $10 \frac{1}{11} + v.$ ; P. 22; V.  $\frac{1}{2}$ ; A.  $\frac{1}{11} + v.$ ; C. 21.

Resembles *S. microlepidotus*, except that there are two shining light spots above and behind either eye, and the spinous dorsal is posteriorly edged with black.

The Andamans.

The 'scombers' or Mackerels deposit their eggs in the open sea, hence their young are rarely seen on the coast.

Here follows the genus *Thynnus*, embracing the 'Tunnies' and 'Bonitos,' which are excellent for food. They are very voracious, remarks Day, and may often be observed in 'schools' pursuing the *Exocoeti* (flying fish) or *Clupeidae* (Sardines), etc. As food they are moderately approved of, as when fresh their flesh sometimes causes visceral derangement, but they are largely salted or dried, both in Europe and Asia.

*CYMBIUM*, Cuvier.

'Seer fishes.'

Branchiostegals 7. Pseudobranchiæ. Teeth large and strong in the jaws. Villiform on the vomer, palatines, and tongue. Two dorsal fins. Seven or more finlets behind the soft dorsal and anal fins.

The seer fishes of India, remarks Day, are considered among the most delicate of the marine forms for the table. Under a foot in length, they are apt to be dry, but when from  $1\frac{1}{2}$  to  $2\frac{1}{2}$  feet in length are at their best. Above this size, again, their flesh becomes coarse. They also salt well, and make excellent 'tamarind fish,' as fish are called when prepared or pickled with tamarind pulp.

*C. GUTTATUM*, Bl. Schn.

*C. lineolatum*, Cantor.

Kūn-shat.

B. vii.; D.  $16\cdot17 \frac{1}{14}-\frac{1}{15} + viii\cdot x.$ ; P. 21; V.  $\frac{1}{2}$ ; A.  $\frac{3}{17}-\frac{3}{19} + vii\cdot ix.$ ; C. 26.

Teeth lancet-shaped, laterally compressed, distant 10 to 12 in either jaw, longer in the lower. The keel on the lateral line well developed. Colour bluish above, silvery below. Three rows of round or horizontally oval spots along the back and sides. The dorsal web, from the first to the eighth spine, black, the rest pure white, edged with black. Grows to 3 feet or so.

Tavoy coast.

Four other species inhabit the Indian seas: *C. Kuhlî*, Cuv. et Val.; *C. interruptum*, Cuv. et Val.; *C. Commersonii*, Lacép.; and *C. lineolatum*, Cuv., which last, Mason says, is largely dried at Tavoy.

Last in the family of 'Scombers' comes the singular genus *Echeneis* or 'sucking fish,' with flat heads, covered by an adhesive or pneumatic disk. This disk is formed by a modification of the first dorsal fin, and by its means the fish attaches itself firmly to any smooth surface. They commonly attach themselves to sharks, so as to have been regarded as parasitic on those creatures. They were also supposed to be endowed with the power of arresting vessels at full speed, which is a fable no doubt founded on their attaching themselves frequently to them.

"Parva Echeneis adest (mirum) mora puppibus ingens."—*Ovid*, *Halieuticon*.

A curious use to which the *Echeneis* is sometimes put is to catch turtle and large fish. A cord is fastened round the fish's tail, and it is then 'slipped' as it were at the turtle. The terrified fish at once fixes on the turtle, which is then hauled up and secured. This curious method of fishing is said to have been found in use in Cuba by Columbus, and is also stated by Dampier and Commerson to be

practised on the coasts of Natal, Mozambique, and Madagascar. Cantor says that they are regarded as a powerful manure for fruit trees, whence it would seem they must be far from rare in the Malayan seas. Day enumerates four species from the tropical seas:—*E. neucrates*, L.; *E. remora*, L.; *E. brachyptera*, Lowe; and *E. albescent*, Tem.

Next to the scombers, Day places the URANOSCOPIDÆ, or 'mud fishes,' divided into two genera, *Uranoscopus* and *Ichthyoscopus*, the former possessing two dorsal fins, the latter but one. These repulsive fish bury themselves in the mud, with only the top of the head (whereon are the eyes) and mouth exposed ready to ingulph within their vertical and capacious jaws any animal which may unwarily pass over them, much as the ant-lion does, among insects. Day enumerates two species, *Uranoscopus guttatus*, Cuv. et Val. and *Ichthyoscopus inermis*, Cuv. et Val.

### Family Trachinidæ.

Body elongated, posteriorly compressed. The preopercle articulates with the suborbital bones.

PERCIS, Bloch. Schneider.

Branchiostegals 6. Pseudobranchiæ. Lower jaw the longer. Villiform teeth in the jaws, with an outer enlarged row and canine-like ones. Teeth on the vomer, but not on the palatines. Two dorsal fins, soft dorsal and anal similar. Air-vessel none.

*P. PUNCTATA*, Cuv. et Val.

B. vi.; D. 5: 21-22; P. 16-17; V.  $\frac{1}{3}$ ; A.  $\frac{2}{17-18}$ ; C. 15.

Snout sharp. Eight curved teeth above the symphysis of the mandible. Fourth dorsal spine longest. Caudal cut square. Colour whitish, with reddish-brown vertical bands above the lateral line. A golden line from below the orbit to the base of the dorsal, and another from the eye to the snout. Spinous dorsal sometimes black-spotted. Soft dorsal with three rows of spots on the rays. Caudal banded, and with sometimes an ocellus at the base. Anal yellowish, and ventrals slaty.

The Andamans.

*P. MEXOPHTHALMA*, Cuv. et Val.

B. vi.; D. 5: 19-21; P. 17; V.  $\frac{1}{3}$ ; A. 17-18; C. 15.

Snout somewhat pointed. Teeth in outer row above enlarged, as are 8 or 10 of the anterior ones in the mandible, and some of the middle lateral teeth. Fourth dorsal spine longest. Caudal cut square, with its upper ray a little prolonged. Colour above, greyish brown, with irregular vertical grey lines, also one or two narrow longitudinal lines along the side, and three or more white spots, with a black centre along the belly. Some black lines about the eye. A black spot at the base of the first dorsal. Three rows of black spots along the soft dorsal. Dorsals black-edged, and a black blotch on the caudal followed by a white one.

The Andamans.

*SILLAGO*, Cuvier.

Branchiostegals 6. Pseudobranchiæ. Upper jaw the longer. Villiform teeth in jaws, with an outer conical row on the vomer also, but none on the palatines. Two dorsals. Soft dorsal and anal similar. Air-vessel simple.

*S. DOMINA*, Gill.

B. vi.; D. 9  $\frac{1}{22-27}$ ; P. 24; V.  $\frac{1}{3}$ ; A.  $\frac{1}{22-27}$ ; C. 19.

Head depressed, pyriform, cheeks swollen. Four central teeth in upper jaw largest. Vomerine teeth in a semicircle. First dorsal spine small. Second curved and extends to beyond the caudal, or in large specimens to its base. Scales strongly ctenoid. Colour greenish shot with purple. Grows to 10 inches or more.

Burma, ascending tidal rivers.



*S. SHAMA*, Forsk.

Ngā-rui. Arakan. Ngā-pa-lwe. Burma. (Thol-o-dah. Andamans.)

B. vi.; D. 10-11  $\frac{1}{25}$   $\frac{1}{25}$ ; P. 20; V.  $\frac{1}{3}$ ; A.  $\frac{1}{25}$   $\frac{1}{25}$ ; C. 19.

General form as in *S. domina*, but the second and third dorsal spines subequal. Colour olive green above, lighter below, with a brilliant purple reflexion. A silvery longitudinal band. Dorsal and anal minutely black-dotted. Grows to a foot, or rarely (*fide* Leschenault) to 3 feet.

The Andamans and coast of Burma.

This fish is called "Whiting" at Madras, and is given to nursing mothers, being regarded as more nourishing even than sharks' flesh.

*S. MACULATA*, Quoy et Gaim.

B. vi.; D. 11  $\frac{1}{15}$   $\frac{1}{25}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{1}{25}$   $\frac{1}{25}$ ; C. 18.

Dorsal spines weak, the third to the fifth subequal. Colour grey on the back, white on the belly. Some blackish blotches and a silvery band on the side. Upper half of first dorsal black. Outer edge of soft dorsal and anal dark, and a grey band superiorly along the soft dorsal. Grows to 9 inches or more.

The Andamans.

These fishes (Sillago, which have much the appearance of *Sciæna*) may be captured throughout the year, and are light and wholesome food.

### Family Pseudochromidæ.

*PSEUDOCROMIS*, Rüppell.

Branchiostegals 6. Pseudobranchiæ. Lower jaw the longer. Jaws with a single row of lateral teeth. An outer enlarged row anteriorly in the premaxillaries, and canine-like teeth in the mandible. Teeth on the vomer and palate. A single dorsal. Air-vessel present.

*P. XANTHOCHIR*, Bleeker.

B. vi.; D.  $\frac{3}{5}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{3}{15}$ ; C. 17.

Dorsal spines short, the third longest. Caudal rounded. Colour dull olive. Soft dorsal yellow-spotted above, brown-spotted below. Caudal terminally yellow, and brown-spotted at its base.

The Andamans.

### Family Batrachidæ.

Branchiostegals 6. Pseudobranchiæ. Head large and muciferous system well developed. Gills 3. Opercles armed. Teeth conical, moderate or small. Scales when present small. Air-vessel present.

*BATRACHUS*, Bloch. Schneider.

Character of family. No canine-like teeth. Two dorsals. Air-vessel divided into two lateral parts.

*B. GANGENE*, Ham. Buch.

B. vi.; D. 3:20-22; P. 21; V.  $\frac{1}{3}$ ; A. 16-18; C. 15.

Snout broad, depressed, surrounded by tentacles, and there are others round the eye, and finer ones on the head. The first dorsal triangular, the second spine longest. Colour reddish brown, dark marked. Grows to a foot or more.

Burma, in mud of estuaries.

These fish are esteemed poisonous in Pinang, and are not even used, says Cantor, in consequence, for manure; but they are eaten by the poor in Bombay, according to Day. In one fish of this family, *Thalassophryne reticulatus*, from Panama, Dr. Günther discovered a poison organ structurally as perfect as in serpents, each operculum terminating in a long perforated spine, the canal traversing which communicated with a sac at its base full of a poisonous secretion; a specialized

adaptation of a part of the muciferous system. Capt. Dow (P. Z. S. 1865, p. 167) declared that the natives were aware of the emission of a poison from these organs, which gave rise to fever, but without fatal effects. A slight pressure at the base of the spine would cause the fluid to be projected a foot or more from its orifice.

### Family **Pediculati.**

Branchiostegals 5 to 6. Pseudobranchiæ absent. Gill opening reduced to a small foramen in or near the axilla. Teeth minute.

These fishes inhabit the Indian littoral, but are economically unimportant.

#### *Antennarius, Cuvier.*

Three dorsal spines, the first modified into a tentacle. Teeth on palate. Gill opening lateral. Air-vessel present.

*A. hispidus*, Bl. Schn.

B. vi.; D. 3:12; P. 10; V. 5; A. 7; C. 9.

First dorsal ray erectile, as long as the second, and ending in a fleshy excrescence, which Sir Emerson Tennent compares to a worm or piece of meat. Second and third rays with skinny posterior flaps. Colour yellow, with brown spots and streaks.

*A. nummifer*, Cuv.

B. vi.; D. 3:12; P. 10:13; V. 5; A. 7; C. 9.

First dorsal spine not so long as the second. Colour greyish-brown tinged with purple. A black ocellus, with a yellow edge behind the base of the pectoral, and another below the seventh and eighth dorsal rays. Fins black-spotted.

*A. marmoratus*, Bl. Schn.

B. vi.; D. 3:12; P. 9:10; V. 5; A. 7; C. 9.

The first dorsal short, ending in a small knob, with a minute tentacle. Colour reddish-yellow marbled with brown, and brown spots radiating from the eyes. Sides and belly white-spotted. A very variable species.

*Halieutæ, Cuvier et Valenciennes.*

No teeth on palate. Gill opening on the upper surface of body. No air-vessel.

*H. stellata*, Wahl.

B. vi.; D. 4; P. 13; V.  $\frac{1}{2}$ ; A. 4; C. 9.

A retractile tentacle above the mouth, with a trefoil extremity. Body spinous. Colour pinkish. Grows to 8 inches.

### Family **Cottidæ.**

Branchiostegals (5) 7. Pseudobranchiæ. Infraorbital bones articulate with the preopercle. Teeth villiform. No canines. Two dorsals. Ventrals thoracic.

*Platycephalus, Bl. Schn.*

Lower jaw the longer. Villiform teeth in jaws, vomer, and palatines, with sometimes larger ones intermixed. Two dorsal fins, with an isolated spine anteriorly. Air-vessel absent.

*P. insidiator*, Forsk.

Ngā-bhoo-reng-gyee. Arakan. (A-ra-wad-dah or Chou-ur-dah. Andamans.)

B. vii.; D. 1:7:13; P. 17; V.  $\frac{1}{2}$ ; A. 13; C. 15.

Lateral line smooth. A spine at the antero-superior angle of the orbit. Nostrils patent, but not tubular. Three stellate "raised grooves" on the preorbital. Two strong spines at the preopercular angle, and two on the opercle. Sometimes a fine spine between the dorsals. Colour brownish above, dirty white below. Fins spotted.

Caudal yellow, with a deep black band, obliquely white-bordered above, and white-bordered below.

The Andamans and Arakan coast.

*P. serratus*, Cuv. et Val.

B. vii.; D. 1:8:11:12; P. 19; V. 1; A. 11; C. 13.

Crests on the head bones serrated, but spineless. A finely denticulated ridge from the eye to the preopercle, and a less distinct smooth one above it. Scales with rough borders. Reddish brown above, belly white. Six or eight irregular brown bands along the sides. Fins grey, with black points. A black blotch on the top of the dorsal. Ventrals bluish above, white below. Grows to 7 inches.

The Andamans.

### Family Cataphractidæ.

Head and body more or less angular, covered with plates, or keeled scales.

*Pegases*, *Linnaeus*.

Branchiostegals 1. Pseudobranchiæ absent. Gill opening narrow, in front of pectoral. Body broad and depressed, covered with anchylosed plates. No teeth. A short dorsal and anal. Pectorals horizontal and long, anterior rays shortest. Air-vessel absent.

*P. draco*, L.

B. i.; D. 5; P. 11; V. 2; A. 5; C. 8.

Belly flat. Body with two median and two lateral ridges. Three cross ridges. Tail composed of eight rings. Lateral edges of snout denticulated. Body with brown reticulations. Snout and last caudal ring black.

The Andamans.

### Family Gobiidæ.

*A. Gobiina*.

Ventrals forming a disk, united along their whole extent, or their basal halves only. Two dorsals.

*Gobius*, *Artedi*.

Branchiostegals 5. Pseudobranchiæ. Ventrals adherent to the abdomen only at their bases. Simple teeth in one or more rows above, and two or more below.

*A. Lateral recurved canines in the mandible.*

*G. bynoensis*, Richardson.

B. v.; D. 6  $\frac{1}{16}$ ; P. 19; V. 1; A.  $\frac{1}{16}$ .

Teeth, 2 or 3 rows in either jaw, 10 outer enlarged ones above, and the outer row below enlarged and subhorizontal. Dorsal spines weak, with filiform ends. Dorsals equal in height and but little apart. Colour greenish, with 8 or 10 darkish cross-bars. A band from the snout through the eye to the end of the soft dorsal, black anteriorly, then yellow, and a second from the mouth across the opercles to the tail, black anteriorly, then golden. A superior dark spot at base of the caudal. Anal dark margined.

The Andamans.

*G. punctatus*, Bleeker.

B. v.; D. 6  $\frac{1}{16}$ ; P. 17; V. 1; A. 10; C. 11.

Teeth in several villiform rows in both jaws, the outer rather enlarged. A pair of small canines below. Dorsal spines flexible, with filamentous tips, the first three the longest. Colour olive, spotted with rusty. Fin rays yellow, barred and dotted

with purplish red. Anal with a yellow margin, and sometimes with purplish red streaks.

The Andamans in brackish water.

*B. No lateral recurved canines in the mandible.*

*G. TEXTACTULARIS*, Cuv. et Val.

B. v.; D. 6  $\frac{1}{1-2}$ ; P. 20; V.  $\frac{1}{2}$ ; A.  $\frac{1}{1-2}$ ; C. 15.

The lower jaw the longer. Teeth in one row in the premaxillaries, and in two or three in the mandible. Dorsal spines flexible, extending far beyond the web. A simple tentacle above the posterior third of the eye. Colour shell green, with some reddish spots. First dorsal with 4 to 6 bands of horizontal spots, and 6 to 8 along the second dorsal. Caudal grey. Anal grey, with a basal white band.

The Andamans.

*G. ACUTIPINNIS*, Cuv. et Val.

Mang-moo-goo-da-lah-dah. Andamans.

B. v.; D. 6  $\frac{1}{10-11}$ ; P. 19; V.  $\frac{1}{2}$ ; A.  $\frac{1}{1-2}$ ; C. 19.

A narrow row of warts across the cheeks. A large opening of mucous canals, below and behind the orbit. Villiform teeth in several rows in both jaws. Colour greyish brown above, dull white below. Several dull blotches bar the sides. A dark mark at base of caudal. A brown band from eye to gape. Four lines of spots down both dorsals. Fins grey, pale-edged. Pectorals, ventrals, and anal stained slaty.

The Andamans and seas of India.

*G. PERSONATUS*, Bleeker.

B. v.; D. 6  $\frac{1}{10}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $\frac{1}{1-2}$ ; C. 12.

No warts or tentacles on the head. Teeth in several fixed rows above, the outer teeth longer. In the mandible many villiform rows, the outer fine and slightly elongated. Dorsal spines weak, with filamentous ends, and equalling the last and longest dorsal rays. Caudal cut square. Colour light brown, darker above. A black opercular spot. Back and head vermiculated with black lines and spots. Dorsal with three or four rows of spots which form bars, and sometimes an exterior dark mark behind the fifth spine. Anal white-edged. Caudal barred or spotted.

The Andamans, in brackish water.

*G. ORNATUS*.

B. v.; D. 6  $\frac{1}{10}$ ; P. 21; V.  $\frac{1}{2}$ ; A.  $\frac{1}{8-9}$ ; C. 13.

Teeth in villiform rows. First dorsal lower than the second. Caudal rounded. Colour green, with numerous oblong brown spots. Some of the scales yellow-dotted. All the fins except the ventral black-dotted.

The Andamans.

*G. ALBO-PUNCTATUS*, Cuv. et Val.

B. v.; D. 6  $\frac{1}{2}$ ; P. 21; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 13.

Teeth villiform in both jaws, the outer slightly enlarged. No glands, warts, or barbels on the head. First dorsal lower, or equal to the second. Caudal rounded. An anal papilla. Colour brownish, irregularly marbled. Sides of head and body studded with white spots. Dorsal and caudal greyish, black-dotted, forming 3 rows on the former. Other fins unspotted. Sometimes the fins are dark, with a row of white dots.

The Andamans.

*G. GIURIS*.

Ngā-tha-lōk. (Poo-dah, Andamans.)

B. iv.; D. 6  $\frac{1}{8-9}$ ; P. 20; V.  $\frac{1}{2}$ ; A.  $\frac{1}{8-9}$ ; C. 17.

Interorbital space slightly concave, with an open gland. Teeth in villiform rows in the upper jaw, the outer enlarged anteriorly, laterally the inner of two

rows sometimes the larger. In the mandible an anterior row of enlarged teeth; laterally two rows. Colour fawn colour, with cloudy markings on the head, and irregular bands and blotches on the back and side. Vertical fins spotted. Grows to  $1\frac{1}{2}$  feet in fresh water, but less in the sea.

This species is very variable, and is largely used for stocking ponds, being highly esteemed for food, though rather earthy in flavour, according to European taste.

The Andamans. Eastern seas, and fresh waters of India and Burma.

*G. SEMIDOLIATUS*, Cuv. et Val.

B. v.; D.  $6\frac{1}{2}$ ; P. 17; V.  $\frac{1}{2}$ ; A. 8; C. 13.

Neither scales, warts nor barbels on the head. Teeth in villiform rows, the outer enlarged. In the mandible the last of the outer row is slightly recurved, and in large specimens is probably developed into a posteriorly placed canine-like tooth. Dorsal spines flexible, with filamentous ends. Caudal wedge-shaped. Colour chestnut, with three rather wide interorbital bands. Between the eye and the dorsal are three more bands, and below the dorsal four or five others. Three bands descend from the eye, another over the opercle, and another in front of the pectoral fin. Dorsals brown-spotted.

The Andamans.

*G. SADANUNDIO*, Ham. Buch.

B. v.; D.  $6\frac{1}{2}$ ; P. 19; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 15.

Teeth villiform in both jaws, outer ones in premaxillaries, enlarged. Caudal rounded. The second and third dorsal spines elongated, filamentous. Colour olive, with very large deep black, white-edged blotches over the body. First dorsal black with a white ring on its last three rays. Second dorsal with two basal rows of black, spots and a median row of white ones. Ventral black, with orange edges. Anal dark olive, black-margined. Caudal with fine black dots.

The coast of Burma.

*G. MILLANOSOMA*, Bleeker.

B. v.; D.  $6\frac{1}{2}$ ; P. 21; V.  $\frac{1}{2}$ ; A. 10; C. 15.

Anterior portion of head and jaws covered with warts and fine hairy barbels. Caudal rounded. Colour brownish, sometimes paler on the head. Dorsal, anal, and caudal very dark, ventrals nearly black, with a reddish edge. Caudal reddish.

The Andamans.

*G. NEXUS*, Ham. Buch.

B. v.; D.  $5\frac{1}{2}$ ; P. 17; V.  $\frac{1}{2}$ ; A. 9; C. 15.

External teeth in mandible, rather enlarged, the outer tooth rather recurved. First dorsal spines with filamentous ends. Caudal wedge-shaped. Colour reddish-brown, with seven black belts, the first through the eye, the next over the opercles, the last at the base of the caudal. These bands involve the vertical fins.

Mainly in fresh water.

*GOMODON*, Bleeker.

Scales none. Teeth conical and fixed. Two dorsals, basally united. Ventrals united.

*G. QUINQUE-STRIATUS*, Cuv. et Val.

D.  $6\frac{1}{10}$  to  $11$ ; P. 19; V.  $\frac{1}{2}$ ; A.  $\frac{1}{5}$  to  $\frac{1}{4}$ ; C. 15.

Body elevated and strongly compressed. Two large canines above the mandibular symphysis. First dorsal half as high as second. Caudal rounded. Head with five vertical orange stripes, and two orange bands rather broken up along the body. Grows to  $2\frac{1}{4}$  inches.

The Andamans and Nicobars.

*G. ERYTHROSPILUS*, Bleeker.

D.  $6\frac{1}{10}$  to  $11$ ; P. 19; V.  $\frac{1}{2}$ ; A.  $\frac{1}{5}$ ; C. 15.

Symphysial lower canines. Dorsal fins usually equal in height. Colour brown, with small black spots. Fins blackish. Caudal wholly white or a white base only. The Andamans and Nicobars.

*G. CITRINUS*, Rüpp.

D. 6  $\frac{1}{5}$ ; P. 20; V.  $\frac{1}{2}$ ; A.  $\frac{1}{5}$ ; C. 13.

Teeth in a single row above. A posterior enlarged row in the mandible, the external of which is a recurved canine-like one. Dorsals of equal height. Colour yellow. A blue-edged horizontal streak goes along the bases of the dorsal and anal fins. There are four similar vertical bands, two descending from the eye, one from the head to the opercles, and a fourth in front of the pectoral fins. A black spot on the opercle.

The Andamans and Nicobars.

*SICYDIUM*, *Curier et Valenciennes*.

Branchiostegals 4. Pseudobranchiæ, a slit behind the fourth gill. Upper jaw rather prominent, containing a single row of small teeth, implanted in the gums. Two dorsal fins. Ventrals united, forming a disk, more or less adherent to the belly. Air-vessel absent.

*S. FASCIATUM*.

B. iv.; D. 6  $\frac{1}{5}$ ; P. 17; V. 6; A. 11; C. 13.

Snout overhangs. No barbels. The inner teeth in the mandible large, recurved, distant, with two symphysial canines and a minute row of sharp teeth on the lower lip. Colour reddish-brown, with six dark vertical bands on the body, and some dark spots. Below dirty yellowish brown. Fins blackish, pale-edged. Grows to 2 $\frac{1}{4}$  inches.

Burma.

*APOCRYPTIS*, *Curier et Valenciennes*.

Branchiostegals 4. Pseudobranchiæ rudimentary. Teeth conical in a single fixed row in either jaw, and usually a pair of lower symphysial canines behind the fixed row. Ventrals united, forming a disk. Two dorsals.

*A. BATOIDES*, Day.

B. iv.; D. 6: 23; P. 21; V.  $\frac{1}{2}$ ; A. 23; C. 13.

Eight or ten pointed *brown* teeth on either side of both jaws. Two moderate posterior canines in the mandible. Dorsals of equal height. Caudal lanceolate. Colour greyish above, whitish below. Fins without marks.

Maulmain.

This species differs from *A. bato* (which has notched teeth) by its sharp ones.

*APOCRYPTICHTHYS*, Day.

Branchiostegals 5. Symphysial canines in the upper jaw only.

*A. CANTORIS*, Day.

B. v.; D. 6·27; P. 19; V.  $\frac{1}{2}$ ; A. 26; C. 17.

An angular pendulous flap of skin from the preorbital falls down below the teeth on the side of the upper jaw. No barbels. Thirteen elongated and curved teeth on either side of both jaws. The two upper central ones curving down beyond the lips. Head scaleless. Colour greyish olive; first dorsal dark and longitudinally banded. Caudal dark, superiorly spotted.

The Andamans.

*PERIOPHTHALMUS*, *Bl. Schn.*

Branchiostegals 5. Pseudobranchiæ rudimentary. Body elongated, subcylindrical in front. Profile above the eyes very steep. Eyes close together, prominent, with well-developed lids. Two dorsal fins. Ventrals partly united. Caudal obliquely truncated below. Air-vessel absent.

The *Periophthalmi* are capital climbers and walkers on the mud by means

of their muscular pectorals, and they are as much at home on the mud as in water, from which they make their escape as fast as they can, if washed in by the swell of a passing wave when basking on the banks. Day remarks of them, that they plant their pectoral fins "firmly as an organ of support, the same as one places one's elbows on a table, then they raise their heads and take a deliberate survey of surrounding objects."

P. KOLLERFELI, Pall.

Chood-mud-dah. Andamans.

B. v.; D. 10-15:12-13; P. 15; V.  $\frac{1}{2}$ ; A. 11-14; C. 11.

Skin of the snout forms fleshy flaps. Teeth, about 24 conical pointed ones in each jaw. Body olive brown, with white or blue dots. Head sometimes blue-spotted. First dorsal bluish, with a dark edge and white top, sometimes basally white-spotted. Second dorsal with a white-edged black band down it, and white spots at its base.

The Andamans and Burmese coasts and tidal rivers.

P. SCHLOSSERI, Pall.

B. v.; D. 0-15:1-7; P. 9; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 12.

Colour brownish, banded with emerald green spots. In some lights uniform bright green (*vide* Day). First dorsal black, bluish above, edged with white, a scarlet band along its centre, with a white dot between each ray. Second dorsal similar, but lighter and spotted. Anal white-edged. The male has a black band cobalt above, and a scarlet edging along the first dorsal.

Coasts and tidal rivers of Burma.

BOLEOPHTHALMUS, *Cuvier et Valenciennes*.

Branchiostegals 5. Pseudobranchiae, a slit behind the fourth gill. Eyes very prominent, close together, with well-developed outer eyelids. Teeth in a single row in both jaws, and a pair of symphyseal hinder canines in the lower. Two dorsals. Ventrals more or less united. Caudal obliquely truncated below.

B. GLAUCUS, Day.

B. v.; D. 5:27; P. 19; V.  $\frac{1}{2}$ ; A. 25; C. 13.

A few tentacles along the mandibular rami, none below the symphysis. 13 canine-like teeth in front of the upper jaw, and laterally 13 more as large as those in the mandible. In the mandible 25 subhorizontal and pointed teeth all equal, and a pair of symphyseal canines in the rear. Ventrals united along their whole extent. Scales minute, but visible posteriorly. Colour greenish, tinged with violet along the belly. Cloudy bands on head, and a few distant black spots on the cheeks and back. Second dorsal dark-lined. Anal yellowish. Caudal light below and dotted above, or covered with small ocelli.

The Andamans.

B. VIRIDIS, Ham. Buch.

B. v.; D. 5:26; P. 21; V.  $\frac{1}{2}$ ; A. 26; C. 15.

A few tentacles along the mandibular rami, and a larger one beneath the symphysis. Colour greenish above, white below; distant black spots on head, body, and dorsals. Caudal angularly banded above, white below.

Akyab.

B. BODDAERTI, Pall.

B. v.; D. 5:24-25; P. 17; V.  $\frac{1}{2}$ ; A. 24; C. 13.

The 6 central teeth in the premaxillaries canine like, laterally 30 smaller. In the mandible 30 horizontal truncated teeth in each ramus, with a pair of symphyseal canines behind. Colours greenish-blue, with 7 or 8 vertical black bands. Body covered with opaque blue spots. Dorsal blue-spotted. Pectoral orange, black-edged, or dark with orange margin. Anal and caudal dark. Ventrals purplish.

Burma.

*B. PICTINIROSTRIS*, Gmel.

B. v.; D. 5; 23·24; P. 18; V.  $\frac{1}{2}$ ; A. 23·24; C. 14.

6 enlarged central teeth and 40 small ones on either side in the upper jaw. In the mandible 35 to 40 truncated and notched ones in either ramus, and a pair of symphyseal canines. Caudal pointed. The body covered with tubercles and verdigris spots. Dorsal blue-spotted.

Tenasserim.

*B. Electrica*.

*Ventrals not united together.*

*BOSTRICHIDYS*, Dumeril.

Branchiostegals 4 to 6. Pseudobranchiae. Teeth in jaws and vomer, but no canines. Two dorsal fins. Ventrals proximate, but not joined.

*B. SINENSIS*, Lacép.

Lee-mee-jo-do-dah. Andamans.

B. v.; D. 6  $\frac{1}{10-12}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 13.

Branchiostegals 5. Colour dark brown, marbled. A black, white-edged ocellus at the root of the tail. Three bands of spots along the dorsal, and caudal vertically banded by spots.

The Andamans.

*ELECTRIS*, *Gronovius*.

Branchiostegals 4 to 6. Pseudobranchiae. Teeth small, none on the vomer or palatines. Two dorsals. Air-vessel large. Anal papilla distinct.

*E. FELICEPS*, Blyth.

B. v.; D. 6  $\frac{1}{10}$ ; P. 15; V.  $\frac{1}{2}$ ; A. 11; C. 13.

Eyes close together. Teeth villiform. Dorsal spines filiform. Central caudal rays longest. Colour brownish-white, spotted and blotched with darker. Bands from the orbit. Type  $1\frac{1}{2}$  inches.

The Andamans.

*E. MACRODON*, Bleeker.

B. v.; D. 6  $\frac{1}{5}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 13.

Head flat. Lower jaw longer. Anterior nostril tubular. A small barbel on either side of the upper jaw. Several rows of villiform teeth in either jaw, 8 or 10 enlarged ones on the premaxillaries, two of which are canine-like. In the mandible 4 to 6 canine-like teeth in front. Posterior half of caudal scaled. Colour brownish, second dorsal brown-spotted. A dark pale-edged ocellus at the base of caudal. Grows to  $4\frac{1}{2}$  inches.

Estuaries and tidal rivers in Burma.

*E. POROCEPHALUS*, Cuv. et Val.

A-rig-dah and Mu-took-dah. Andamans.

B. v.; D. 6  $\frac{1}{10}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 15.

Head obtuse, depressed. Lower jaw the longer, the anterior nostril tubular. The outer row of teeth on the mandible slightly the largest. Caudal rounded. Colour deep blackish brown, dark marbled. Second dorsal with three or four rows of spots. Anal dark-banded, sometimes the body light-spotted.

The Andamans.

*E. SCINTILLANS*, Blyth.

B. v.; D. 6  $\frac{1}{2}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 13.

Lower jaw the longer. Anterior nostril in a short tube. No spine on the preopercle. Teeth villiform, the outer mandibular ones a little larger. Brownish marbled with darker, and the scales shot with light spots. Both dorsals with three



rows of spots. Caudal dark, with a white edge. A dark ocellus at the base of the caudal fin.

The Andamans. Closely allied to the last, of which it may be the young.

*E. OPHTHOCEPHALUS*, Cuv. et Val.

A-rig-dah and Mu-took-dah. Andamans.

B. v.; D. 6  $\frac{1}{2}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 15.

The anterior nostril tubular. Teeth in numerous villiform rows, the outer rather enlarged and pointed. The last dorsal rays prolonged to the base of the caudal. Caudal rounded. Colour olive brown, irregularly blotched on the sides. Three black bands radiate from the eye. Sometimes a pectoral ocellus. Vertical fins pale-margined. A dark band along the second dorsal, anal, and ventral fins. Sometimes the soft dorsal and anal fins are yellow-spotted. Grows to 9 $\frac{1}{2}$  inches or more.

The Andamans.

*E. CAVIFRONS*, Blyth.

B. v.; D. 6  $\frac{1}{2}$ ; P. 13; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 15.

Head depressed, a deep depression exists over the orbits. Lower jaw the longer. A well-marked downward spine at the angle of the preopercle. Anterior nostril somewhat tubular. Teeth villiform, the outer row of the premaxillaries rather enlarged, and the inner row on the mandible, and directed slightly inwards, and with 4 or 5 large canine-like teeth in front. Caudal obtusely rounded. Colour light brown; dark bands radiate from the orbits. A few dark spots on the body. Dorsal and caudal barred in spots. Grows to 4 inches.

The Andamans.

*E. FUSCA*, Bl. Schn.

*E. Soaresi*, Playfair.

B. vi.; D. 6  $\frac{1}{2}$ ; P. 18; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 12.

Head depressed; lower jaw rather the longer. A short downward spine on the preopercle. Teeth in many villiform rows, the outer row wide apart and twice the size of the rest. In the mandible usually some enlarged ones. Caudal wedge-shaped. Colour leaden black, lighter on the belly, which is sometimes yellow-tinged. Dorsal horizontally barred, and caudal sometimes vertically. Markings and colour variable, sometimes stone colour above. Grows to 8 inches.

The coast of India (Burma).

*E. LUTEA*, Day.

B. vi.; D. 6  $\frac{1}{2}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 15.

Top of head and interorbital space flattened. Head scaleless. Lower jaw the longer. Anterior nostrils tubular. A downward spine on the preopercle. First dorsal spines with filamentous ends. Second dorsal highest anteriorly. Colour dirty grey, vertically banded. Head dark-spotted. Dorsals and anal black-spotted in bands. Caudal black, reticulated.

The Andamans.

*E. LITORALIS*, Day.

B. vi.; D. 6  $\frac{1}{2}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 13.

Top of head flat. Lower jaw the longest. Anterior nostrils tubular. Teeth in close villiform rows in both jaws, the inner slightly larger. First dorsal spines extend beyond the web. Caudal wedge-shaped. Colour brownish, dark-marked. Fins dark, minutely punctate. Three or four bars of spots on the dorsals. Caudal blackish. Anal with a central black band and white edge. Type 3 inches.

The Andamans.

*E. CAPERVATA*, Cantor.

Oo-suf-foo. Arakan.

B. v.; D. 6  $\frac{1}{2}$ ; P. 21; V.  $\frac{1}{2}$ ; A.  $\frac{1}{2}$ ; C. 15.

A slight transverse depression behind the snout. Supraorbital margin serrated, and a serrated ridge along either side of the hind limb of the premaxillary. Teeth in villiform rows, the outer enlarged. Caudal rounded. Colour leaden brown, fins blackish. A deep black blotch edged with scarlet at the base of the pectoral. The second dorsal, caudal, and anal spotted.

The Andamans.

*C. Amblyopina.*

*Vertical fins united, a single dorsal occupying the back.*

GOMOIDES, *Lacépède.*

Branchiostegals 5. Gills 4. Pseudobranchiæ absent. Body elongate. Lower jaw prominent, so that the cleft of the mouth is directed upwards. Anterior teeth very strong. Eyes minute. Scales none, or rudimentary.

G. CÆCULUS, Bl. Schn.

B. v.; D. 6:40:41; P. 15; V.  $\frac{1}{2}$ ; A. 38:45; C. 13.

A few mandibular barbels. An outer row of curved teeth, 16 to 18 above, 10 to 13 below, with villiform ones inside. Caudal short and pointed. Scales none. Colour variable. Leaden above, lighter below. Vertical fins grey. Central caudal rays black, pectorals and ventrals reddish. Sometimes the fish is a general reddish-brown colour.

The Andamans.

This fish is very vicious (like its congeners), and if its tail is touched, will spring round and snap and grip like a bull-dog, with the utmost tenacity.

G. BUCHANANI, Day.

B. v.; D. 6:42; P. 19; V.  $\frac{1}{2}$ ; A. 36; C. 17.

The posterior nostril opens just before the eye, and the anterior tubular one close to the front edge of the snout. A minute pair of symphysial barbels on the mandible, and a still smaller pair behind them. Vertical fins continuous. Scales none, save a few rudimentary ones in crypts anteriorly. Colour brownish-olive above, reddish below. Pectoral and ventral fins yellow, with outer halves black. Vertical fins blackish.

Coast of Burma (Maulmain).

TRYPAUCHEN, *Cuvier et Valenciennes.*

Branchiostegals 4. Pseudobranchiæ. A blind cavity above the opercle, not communicating with the branchiæ. Body compressed and elongate. Eyes minute. Teeth in a band, no canines. Scales small.

T. VAGINA, Bl. Schn.

B. iv.; D. 6:40:49; P. 15; V.  $\frac{1}{2}$ ; A. 40:46; C. 13.

Lower jaw the longer. Teeth distant, curved, longish, in both jaws, with one inner band above, and two below of fine ones. Caudal pointed, or rounded. Colour roseate white, seasonably brighter. Dorsal and anal grey-edged. Caudal, pectorals, and ventrals, white or yellowish. Grows to 9 inches, and is eaten by the poor.

Coasts of India and Burma.

*Family Callionymidæ.*

Branchiostegals 5 or 6. Pseudobranchiæ. The infraorbital ring of bones does not articulate with the preopercle. No palatine teeth. Two dorsal fins. Air-vessel none.

CALLIONYMUS, *Linnaeus.*

Gill opening narrow, sometimes merely a round hole at the upper edge of opercle. Body anteriorly depressed. Mouth narrow, upper jaw protractile. A strong spine at the angle of the preopercle. Teeth in jaws minute.

*C. LONGICAUDATUS*, Tomm. et Schl.

B. v.; D. 4; 9; P. 20; V. 5; A. 9; C. 10.

Gill opening small, superior. Lateral line single. Numerous rows of warts on the head. Dorsal spines in the male filiform and extending beyond the web. Caudal lanceolate. Colour buff, with light rounded dots over the head and body, sometimes dark-edged. First dorsal and ventrals greyish; second with four rows of spots. Caudal banded with spots. Anal with a black, white-edged band externally.

The Andamans.

### Family Blennidæ.

Pseudobranchiæ. The infraorbital ring of bones does not articulate with the preopercle.

#### A. No molar teeth. Caudal distinct.

*BLENNIUS*, *Artedi*.

Gill opening wide. A single row of fixed teeth in the jaws. Scaleless.

*PETROSCITES*, *Ruppell*.

Gill opening small. A single row of fixed teeth in the jaws, with a large lateral canine. Scaleless.

*P. VARIABILIS*, Cantor.

B. vi.; D. 28·31; P. 13; V. 4; A. 17·21; C. 13.

A short simple tentacle at the postero-superior edge of the eye, and a very short one on either side of chin. Lower canines large, upper small. Caudal cut square and said to have its upper and lower rays sometimes produced. Colour pinkish with dark spots. A broad dark band from the eye to the tail, where it ends in a blotch. A second dark band is sometimes present. Two or three blue bands pass downwards from the eye. Head light-spotted. Dorsal and anal fins marbled and spotted in lines. Caudal yellow vertically banded in spots.

The Nicobars.

*SALARIAS*, *Carier*.

Gill opening wide. A single row of fixed teeth in the jaws. Scaleless. Dorsal single.

#### a. Dorsal fin not notched.

*S. TRIDACTYLUS*, Bloch. Sehm.

B. vi.; D. 12·13; 19·22; P. 13; V. 3; A. 25·26; C. 11.

Snout overhanging. Head crested; a small single tentacle over the postero-superior angle of the eye, but none on the neck or the nostril. Teeth in jaws small. Plumbeous, with vertical bands, fine black spots on the head and forepart of body and some light spots on the body as well. Dorsal fin obliquely black and white streaked, with a white outer edge. Caudal yellow, with the rays black.

The Andamans.

#### b. Dorsal fin distinctly notched.

*S. QUADRICORNIS*, Chv. et Val.

B. vi.; D. 13; 20·22; P. 14; V. 2; A. 22·24; C. 13.

Male crested. A simple tentacle above the eye, a fringed one at the nostril, and a small one on the nape. No canines. Anal lower than the dorsal and its web deeply cleft. Colour very variable. Brownish, with 8 or more vertical bands. Dorsal and anal fins with horizontal white bands.

The Andamans.

*S. HASSELTHI*, Bleeker.

B. vi.; D. 12; 23; P. 14; V. 3; A. 21·25; C. 14.

A line of open glands along the hind and lower edge of the preopercle. Male crested ? . A short fringed supraorbital tentacle, another at the nostril, none on the nape. No canines. Dorsal deeply notched. Colour, stone colour, with six darker vertical bands and several lighter longitudinal stripes. Dorsal brownish, oblique, striped at its base with 5 or 6 narrow bands, above blue-brown and yellow. Anal dark-edged.

The Andamans.

*S. ANDAMANENSIS*, Day.

B. vi. ; D. 12:22 ; D. 15 ; V. 4 ; A. 22·24 ; C. 11.

Profile vertical. Head crested (male's ?). A supraorbital tentacle. A pair of posterior mandibular canines. Caudal with central rays longest. Colour brownish with 10 brown bars along the centre of the body. A row of pearly oblong spots, with dark margins above the centre of the body posteriorly, and another below it. Dorsal dark-margined, and edged with white, and posteriorly spotted. Anal black-edged. Caudal barred. Pectoral and ventral fins white.

The Andamans.

*S. DUSSEMIERI*, Cuv. et Val.

B. vi. ; D. 12:20·24 ; P. 14 ; V. 3 ; A. 22 ; C. 11.

Males crested. A supraorbital fringed tentacle, and a short one in front of the nostril; none on the nape. No canines. Dorsal rounded, central rays longest. Colour brownish, vertically banded. Three or four horizontal bands or rows of spots along the first dorsal, and numerous oblique ones on the second. Upper half of caudal banded in spots. Anal grey, black-edged.

The Andamans.

*S. PERIOPHTHALMUS*, Cuv. et Val.

B. vi. ; D. 12:20 ; P. 15 ; V. 2 ; A. 21 ; C. 15.

Profile vertical. A simple tentacle above the orbit, and a fringed one at the nostril. A crest sometimes present. Posterior canines in the mandible. Colour rose, with violet cross-bands. An oblique blue band under the eye, a small spot on the cheek, and a large one on the opercle. Along the sides two rows of blue spots margined above and below with black. Caudal yellow, red-spotted.

The Andamans.

*S. STRIOLATUS*, Day.

B. vi. ; D. 12:20·21 ; P. 14 ; V. 2 ; A. 20·24 ; C. 13.

Profile vertical. A simple supraorbital tentacle, and another nasal one; none on the nape. Small posterior canines in the mandible. Caudal rounded. Greyish, indistinctly cross-banded. A blue spot below the eye. Five or six horizontal black lines between the pectoral and tail, ending in spots. Dorsal fins with two rows of spots, more distinct behind. Anal with a basal row of blue spots, and grey-edged. Caudal sinuously banded.

The Andamans.

*S. BILTONENSIS*, Bleeker.

B. vi. ; D. 12:20 ; P. 13 ; V. 2 ; A. 20·21 ; C. 15.

Profile prominent. A large rounded crest on the head. A simple tentacle over the orbit, and a fringed one at the nostril; none on the nape. A pair of small canines on the mandible. Greenish stone colour, with some bluish spots about the eyes, and 8 pairs of vertical streaks on the body, and sometimes 8 or 10 longitudinal ones. Dorsal marked with brown, and oblique brown marks on lower half of second dorsal. Anal dark-edged. Caudal dark, with 6 or 7 vertical bands.

The Andamans.

*S. ALBOGUTTATUS*, Day.

B. vi. ; D. 12:18 ; P. 15 ; V.  $\frac{1}{2}$  ; A. 19·20 ; C. 13.

A low crest on the head. A fringed tentacle over the orbit, and a similar one at the nostril, but none at the nape. A small posterior canine in the mandible. Light brown, with 8 pairs of vertical bands, as broad as the interspaces. An oval blue spot behind the eye. Many small dark-edged round ones on the head. Two large brown ones at the base of the brown pectoral fin. Two or three rows of white spots on the lower and posterior half of the body. First dorsal brown, second white, both obliquely banded. Caudal banded with spots, and with a dark spot at its base.

The Andamans.

*S. VERMICULATUS*, Cuv. et Val.

V. vi. : D. 12·13 : 15 ; P. 14 ; V. 2 ; A. 18·19 ; C. 11.

No crest. A longish fringed tentacle over the orbit, and a smaller one over the anterior nostril, also a fine occipital one. Upper lip fringed. Large canines in the mandible. Caudal cut square. Brownish superiorly, bluish-white below, with 9 brown bars descending from the lateral line. The head, body, and fins irregularly reticulated.

The Andamans.

*ANDAMIA*, Blyth.

Gill opening wide. A single row of movable teeth. A symphysial sucker beneath the mandible. No canines.

*A. EXPANSA*, Blyth.

*Salarias heteropterus*, Bleeker.

B. vi. ; D. 16 : 18 ; P. 14·15 ; V. 3 ; A. 25·26 ; C. 14.

Lips thick, continuous, and expanded below into a sucker. Colour olive, dark-banded. Head spotted.

The Andamans and Nicobars.

The sucker in this '*blenny*' recalls the sucker of the 'cyprinoid' *Homaloptera*.

### Family Rhynchobdellidæ.

Branchiostegals 6. Pseudobranchiæ absent. Gills 4. Gill opening a slit on the side of the head. Body eel-shaped. Lower jaw long. A long dorsal fin, anteriorly consisting of free spines. Ventrals none. Air-vessel present.

*RHYNCHOBDELLA*, Bloch-Schneider.

A long fleshy snout, concave and transversely striated below. Teeth minute on jaws and vomer. Scales small.

*R. ACULEATA*, Bloch.

Ngā-mynwe-do.

B. vi. ; D. 16·20 : 41·54 ; P. 23 ; A. 2·3 : 41·52 ; C. 15.

Brownish or greenish mottled superiorly, and yellowish below. A light band just above the lateral line. A series of 3 to 9 large black ocelli, white or buff-edged, along the base of the dorsal. Caudal with 6 to 8 vertical brown bars. Other fins greyish, pectoral sometimes yellow. Sometimes the ocelli are wanting, or the body (in Burmese specimens) white spotted, and the fins reddish.

These "spined eels" are excellent eating, and are widely distributed. In addition to respiration through their gills, they require to respire air directly, and die drowned if kept under water and access to air denied.

*MASTACEMBALUS*, Cuvier et Valenciennes.

A long fleshy appendage to the snout, which is not transversely striated below. Teeth minute. Scales small.

a. *Vertical fins distinct from the Caudal.*

*M. UNICOLOR*, Cuv. et Val.

B. vi. ; D. 33·34 : 81·94 ; P. 27 ; A. 3 : 75·98 ; C. 25.

Of a uniform brown colour, or covered with large yellow blotches.  
Burma (Rangoon).

*M. zibinus*, Blyth.

Ngā-myuwe-do-wet-toung. Ngā-yeng-bho (Tavoy).

B. vi.; D. 28-29; 50-52; P. 19; A. 3; 51-56; C. 19.

Yellow, with vertical blue stripes. Fins striped or spotted.

Burma and the Upper Irrawaddy Valley.

b. *Vertical fins confluent with the Caudal.*

*M. ARMATUS*, Lacép.

Ngā-myuwe-do.

B. vi.; D. 32-39; 74-90; P. 23; A. 3; 75-88.

Greenish, marbled and spotted, with or without undulating lines, or rich brown, lighter below; in some a dark undulating band through the eye along the side superiorly, and above it sometimes a row of black spots. Fins usually spotted. Grows to 2 feet, and is excellent eating.

Burma, in fresh and brackish waters.

The colours of the *Mastacembali* vary considerably with age and locality. They are all excellent eating.

*Family Mugilidæ.*

Branchiostegals 4 to 6. Pseudobranchiæ. Gills 4. Gill openings wide. Body compressed posteriorly and often depressed anteriorly. Teeth very fine, sometimes absent. Two dorsal fins.

*MUGIL*, *Artedi*.

A. *Adipose eyelids well developed.*

None of this section are quoted by Day from any Burma locality, though no doubt many species occur on the coast, as he enumerates 12 from the "seas of India."

B. *No adipose eyelids.*

*M. corsula*, Ham. Buch.

Ngā-zyn.

B. vi.; D. 4  $\frac{1}{8}$ ; P. 15; V.  $\frac{1}{8}$ ; A.  $\frac{3}{8}$ ; C. 15.

Dorsal profile nearly horizontal. Eyes elevated. Snout overhanging. A single row of fine teeth in either jaw. Dull brown above, lighter below. Dorsal and caudal fins tinged grey. Eyes golden. Peritoneum black. These fish swim with their goggle eyes just above the water. When alarmed, they slip their heads below the surface, and after some vigorous shoots reappear some distance in advance, swimming usually not far beneath the surface. They grow to 1½ feet or more, and are excellent eating, as are most of the species.

Rivers in Burma (and India) far above the tideway.

*M. HAMILTONII*, Day.

B. vi.; D. 4  $\frac{1}{8}$ ; P. 13; V.  $\frac{1}{8}$ ; A.  $\frac{3}{8}$ ; C. 15.

Interorbital region more convex than in *M. corsula*. Teeth none. Silvery shot with gold, and plumbeous along the back. Grows to 4½ inches.

Rivers of Burma.

*M. CRENILABRIS*, Forsk.

B. vi.; D. 4  $\frac{1}{8}$ ; P. 17; V.  $\frac{1}{8}$ ; A.  $\frac{3}{8}$ ; C. 16.

Upper lip very thick, forming the end of the snout, and with five rows of soft tubercles along its lower fourth, the lower of which are branched. Lower lip thick,

reflected, thickly studded with tubercles. Teeth none. Greenish brown along the back; dull white below. A black spot above the base of the pectoral fin.

The Andamans and Nicobars.

*M. CERULEO-MACULATUS*, Lacép.

B. vi.; D.  $4\frac{1}{2}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $\frac{3}{4}$ ; C. 11.

Upper lip thick, placed obliquely, so as not to form part of the end of the snout. Teeth minute. Silvery, lighter below. A black spot above the base of the pectoral fin. Grows to  $1\frac{1}{2}$  foot or more.

The Andamans.

The '*mugilis*,'<sup>1</sup> which Juvenal alludes to as sometimes subserving the vengeance of an injured husband, probably applies to a fish of a very different family, and to one well provided with spines.

### Family Aulostomateidæ.

The anterior bones of the skull produced, forming a long tube, and having a small mouth in front.

*FISULARIA*, *Linnaeus*.

No scales. Caudal forked, with one or two of its central rays excessively elongated and filiform.

*F. SERRATA*, Crv.

B. vii.; D. 13-15; P. 13; V.  $\frac{1}{2}$ ; A. 14-15; C. 10-1-10.

A serrated ridge from the eye to the nostril. The caudal filament nearly a third the length of the head and body.

The Andamans, where Day says it affects muddy localities.

### Family Ophiocephalidæ.

Branchiostegals 5. Pseudobranchiæ absent. Gills 4. Body elongated. Head depressed, with somewhat plate-like scales. A cavity exists above and accessory to the true gill chamber. A single long, spineless, dorsal, and a similar but shorter anal. Teeth in jaws, vomer, and palatines. Air-vessel present.

The Ophiocephali or Snake-heads are remarkable for their longevity out of water, a privilege doubtless due to their amphibious mode of respiration, as, in addition to the gills which they possess in common with other fishes, they have a cavity for the reception of air, communicating with the bronchial chamber. Day remarks, "Judging from their habits in an aquarium, some of the *Ophiocephali* prefer dirty to clean water, perhaps for the purpose of concealment. When they have stirred up all the sediment and exuded a quantity of mucus, they appear to be delighted, their colours become much more vivid and they ascend to their favorite resort amongst the vegetation just beneath the surface of the water. As soon as clean water is given them, they become excited, as if they imagined the time had arrived when they should change their abode." They are all of them useful as food. Dr. Mason remarks, "Two or three species of *Ophiocephalus* are very common. They are fresh-water fish, appropriately named, for the head is very much like a snake's head, and they are remarkable for the power of making their way from one pool to another on land. One species, it is said, usually lives in hollow logs and holes, never in streams, and often a long time in the jungle without water. It appears to be either the same species, or a nearly related one to the *burachang* of Boutan, which the natives believe falls from heaven, from the circumstance of its being found after rain far from the water. Some of the Karens regard these with a superstitious awe, and abstain from eating them. They have a legend that they were formerly men, changed into fish

<sup>1</sup> "Necat hic ferro; secat ille cruentis  
Verberibus; quosdam micchos et *mugilis* intrat."—SAT. VI. 316.

for their sins; and the Pwo Karens at Tavoy say: 'If people eat them, they will be transformed to lions.' The fame of this fish had reached Greece more than two thousand years ago, for it is mentioned as a remarkable Indian fish by Theophrastus."

*OPHIOCEPHALUS*, Bloch.

Characters of the Family.

*O. MARULIUS*, Ham. Buch.

Ngā-yan-daing.

B. v.; D. 45-55; P. 18; V. 6; A. 28-36; C. 14.

Teeth in numerous villiform bands, with a posterior row of 12 large conical teeth in the mandible. Colour variable with age and locality. Back greyish-green, the immature with a brilliant orange band from the eye to the middle of the caudal fin, but in the more mature 5 or 6 cloudy bands descend below the lateral line. Belly orange, the scales darkest at the base. On the posterior third of body and on the dorsal, anal and caudal fins are pearly white spots, and generally a black ocellus near the tail. Caudal grey. Ventrals orange. Grows to 4 feet, and defends its young with vigour.

Fresh waters in Burma and India.

*O. STRIATUS*, Bloch.

Ngā-yan-young-to.

B. v.; D. 37-45; P. 17; V. 6; A. 23-26; C. 13.

An inner row of conical teeth in the mandible, and cardiform ones on the palatines. Dark greyish or blackish above, whitish or yellowish white below. Checks and lower surface of the mouth streaked and spotted with grey. Band of grey over the belly. Ventral and anal fins greyish, with some white lines and spots on the latter. In the young usually a dark caudal ocellus. Grows to 3 feet.

Fresh waters in Burma and India, especially swamps and grassy tanks.

*O. GACHUA*, Ham. Buch.

Ngā-yan-pa-naw.

B. v.; D. 32-37; P. 15; V. 6; A. 21-23; C. 12.

An inner row of distant conical teeth in the mandible. Colours variable, usually greenish, paler below. Dorsal, caudal and anal slaty, with an orange margin. Pectoral with a black base, and a slight reddish or orange edge. In the young there is often a large ocellus on the last five dorsal rays. Occasionally the body is spotted with white, or even orange. Grows to 13 inches or more.

Burma. The Andamans.

*O. PUNCTATUS*, Bloch.

Ngā-yan-theng-ōng. (Ngā-ain, Arakan.)

B. v.; D. 29-32; P. 17; V. 6; A. 21-23; C. 12.

A posterior row of 4 or 5 conical teeth in the mandible. Colours variable. Greenish above, yellowish on sides and belly. A dark stripe along the side of the head, several dorsal cross-bands. Fins spotted. The caudal and vertical fins narrowly light-edged. Ventrals whitish. In some there are scattered black spots. Grows to a foot or so.

Burma and India, in rivers and stagnant waters.

### Family **Labyrinthici.**

Branchiostegals 4 to 6. Pseudobranchiae rudimentary or absent. Gills 4. Gill opening rather narrow, the membranes united to the isthmus. Above the third or upper portion of the first branchial arch, is a cavity containing an elaborate arrangement of bony laminae, covered by a vascular mucous membrane, adapted for aerial respiration.



A. *Teeth on the palate.*

ANABAS, *Curier*.

Branchiostegals 6. Pseudobranchiæ none. Suprabranchial organ well developed. Dorsal single.

A. SCANDENS, *Dadd*.

Ngā-byē-mā.

B. vi.; D.  $17-18$ ; P. 15; V. 3; A.  $3-11$ ; C. 17.

Lower jaw slightly the longer. Preorbital strongly denticulated. The hinder edge of opercle, sub-, and inter-opercles strongly spinate. Teeth villiform, the outer row slightly enlarged. Colour rifle-green, lighter on the belly. During life, four wide vertical body-bands, and a dark stripe from the gape to the preopercle. An orange variety is sometimes seen. Grows to  $8\frac{1}{2}$  inches.

Estuaries and fresh waters in Burma and India.

These fishes, though rarely growing to more than 8 inches, are highly esteemed as nourishing food, whilst owing to their vitality, due partly to their mixed system of respiration, they can be carried long distances in the living state. They are voracious fishes: and travel about by night from pond to pond, realizing a Yankee's notion of a smart boat, which only requires a good dew to move in. They sometimes, says Day, cause dangerous accidents by slipping into the throat of the fishermen; who, when they catch a fish, are wont to sever the spine with the teeth, to disable it. In this predicament Dr. Day recommends the fish being cut away as far as possible, so that it may bleed to death, and then the remainder being left till softened by putrefaction, when it can be either removed or thrust into the stomach. No force should be used for its extraction, as dangerous laceration of the œsophagus may result.

B. *Fixed teeth in the jaws. Palate edentulous.*

TRICHOGASTER, *Bloch. Schneider*.

Branchiostegals 5. Branchial arches with toothed tubercles. A single dorsal fin. Ventral consisting of a single elongated filiform ray. Teeth small in the jaws. Vomer and palatines edentulous.

T. FASCIATUS, *Bl. Schn.*

Ngā-pyn-kaik-kouk or Ngā-phyn-thale.

B. v.; D.  $13-15$ ; P. 10; V. 1; A.  $11-13$ ; C. 15.

Colour above greenish, below dirty white. A green spot on either gill cover. Eyes red. Fourteen or more oblique orange bands from back to belly. Ventral fin edged with red and variegated with black, green, and white. Dorsal and caudal fins orange-spotted. Grows to 5 inches. India and Burma (and Upper Burma).

T. LABIOSUS, *Day*.

B. v.; D.  $15$ ; P. 10; V. 1; A.  $15-18$ ; C. 15.

Colour above greenish, below lighter. Eight to ten obliquely vertical bars on the sides. A light yellowish-red band, dark-edged behind, crosses the lower jaw, from the eye to behind the lip. Fins dark. Anal edged with yellowish red.

Burma; from Rangoon to Mandalay on the Irrawaddy.

Family **Glyphidontidæ.**

Branchiostegals 5 to 7. Pseudobranchiæ. Gills  $3\frac{1}{2}$ . Teeth in jaws feeble, palate edentulous. A single dorsal. An air-vessel.

AMPHIPRION, *Bloch. Schneider*.

Branchiostegals 5. All the opercles and preorbital denticulated. Teeth in a single row, conical and small. Dorsal spines 9 to 11.

The *Amphiprions* are generally very vividly coloured, and are among the fish which, for some reason or other not known, resort for shelter to the 'Actiniæ' or

floating 'jelly' fish, beneath whose umbrella they habitually reside. This fact was first witnessed by myself in Mergui harbour, where, having transixed a jelly fish floating past the boat with a small splinter of bamboo, I found to my surprise I had at the same time harpooned and landed a small fish. That these fish resort to the shelter of the disk of the *Acaleph* voluntarily is certain, emerging as they do from its shelter, and reseeking it, but the particular benefit they derive is not known. *A. percula* is known to the Andamanese, says Day, by the name of '*Turtle's stomach fish*,' the Actiniae in which it shelters being so called.

*A. ERUPHUM*, Bloch.

B. v.; D.  $\frac{12}{12}$ — $\frac{13}{13}$ ; P. 19; V.  $\frac{1}{1}$ ; A.  $\frac{1}{11}$ — $\frac{2}{11}$ ; C. 15.

Dark yellow, a dark blotch on the side. Ventral brown-edged.

The Andamans.

*A. FRENATUS*, Brevoort.

B. v.; D.  $\frac{12}{12}$ — $\frac{13}{13}$ ; P. 19; V.  $\frac{1}{1}$ ; A.  $\frac{1}{14}$ — $\frac{2}{14}$ ; C. 15.

Brownish orange, lighter below. A blackish blotch descends from the last five dorsal spines and first rays to the middle of the sides. A pearl-coloured or bluish band crosses the opercles from the nape. Ventrals externally blackish.

The Andamans, perhaps a variety of the last.

*A. SEBÆ*, Bleeker.

B. v.; D.  $\frac{12}{12}$ — $\frac{13}{13}$ ; P. 20; V.  $\frac{1}{1}$ ; A.  $\frac{1}{11}$ — $\frac{2}{11}$ ; C. 15.

Brownish black, with two milk-white cross-bands, the first from the nape to the subopercle, over the orbit, and the second from the last 3 dorsal spines and first 4 rays to a little in front of the vent.

The Andamans.

*A. PERCULA*, Lacép.

Ea-ole-jo-do-dah. Andamans.

B. v.; D.  $\frac{14}{14}$ — $\frac{15}{15}$ ; P. 17; V.  $\frac{1}{1}$ ; A.  $\frac{1}{11}$ — $\frac{2}{11}$ ; C. 15.

Bright yellow, with 3 broad milk-white bands black-edged. The first is anteriorly concave (I follow the figure lxxx. f. 4, but Day's description says *convex*); the second from the middle of the dorsal to the vent; and the last over the free portion of the tail.

The Andamans.

*A. BIFASCIATUS*, Bloch.

B. v.; D.  $\frac{13}{13}$ — $\frac{14}{14}$ ; P. 15; V.  $\frac{1}{1}$ ; A.  $\frac{1}{12}$ — $\frac{2}{12}$ ; C. 17.

Brownish black, with 2 milk-white cross-bands; the anterior passes from the nape, over the opercles, just touching the hind edge of orbit; the second, from the last 3 dorsal spines and first rays, to the centre of the body, and backward to the summit of all the dorsal rays. Caudal black, edged with white.

The Andamans.

*A. AKALOPISUS*, Bleeker.

B. v.; D.  $\frac{9}{9}$ — $\frac{12}{12}$ ; P. 19; V.  $\frac{1}{1}$ ; A.  $\frac{1}{13}$ — $\frac{2}{13}$ ; C. 15.

Orange, brightest on the head, chest, and base of tail. A blue band from between the orbits to the dorsal fin, where it bifurcates on either side of that fin. Scales on body light-spotted.

The Andamans.

*TETRADRACHMUM*, *Cantor*.

Teeth villiform, in a narrow band. Air-vessel large.

*T. MARGINATUM*, Rüpp.

B. v.; D.  $\frac{1}{1}$ — $\frac{2}{2}$ ; P. 17; V.  $\frac{1}{1}$ ; A.  $\frac{1}{12}$ — $\frac{2}{12}$ ; C. 17.

Bluish. A dark band below and in front of the first 2 dorsal spines, through the

base of the pectoral, to the ventral. Snout dark. Every scale on the head, chest, and lower two-thirds of body with a black-edged bright blue spot. Soft dorsal and caudal yellow. Spinous dorsal, ventral and anal fins black.

The Andamans.

*T. ARUANUM*, Bloch.

B. v.; D.  $1\frac{2}{3}$   $1\frac{3}{4}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $1\frac{2}{3}$   $1\frac{1}{2}$ ; C. 15.

Pearl-white, with three vertical black bands: the anterior, from the first three dorsal spines through the eye to below the mandible; the second from the sixth to the ninth dorsal spines, to the ventral fins, which are black; the third, from the base of the soft dorsal to the anal. Caudal dark, paler behind.

Burma, the Andamans, and Nicobars.

*POMACENTRUS*, *Curier*.

Teeth small, compressed, the crowns smooth or emarginate. Scales rather large.

*P. TELINEATUS*, Cuv. et Val.

B. v.; D.  $1\frac{3}{4}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $1\frac{2}{3}$ ; C. 17.

Olivaceous, caudal yellow. One or two blue spots on each scale. Three to five blue lines on the forehead, the outer being continued sometimes along the base of the dorsal. A black round spot on the opercle. A black spot edged with blue across the free portion of the tail.

The Andamans and Nicobars.

*P. TRIMACULATUS*, Cuv. et Val.

B. v.; D.  $1\frac{1}{3}$   $1\frac{1}{2}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $1\frac{2}{3}$   $1\frac{1}{2}$ ; C. 17.

Greenish yellow, with three black blotches over the back. Two narrow blue bands between the orbits, dividing the anterior blotch into three parts. A light blue line along the interorbital bones and spots on the cheeks and the bases of the dorsal and anal fins. Dorsal and caudal with a narrow dark edge, and with a broad dark outer margin, with one or two narrow blue lines at its base.

The Andamans.

*P. BIFASCIATUS*, Bleeker.

B. v.; D.  $1\frac{3}{4}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $1\frac{2}{3}$   $1\frac{1}{4}$ ; C. 17.

Yellow, with a curved blue line on the preorbital, a black band from the nape over the opercles, and a second from the last dorsal spines to below the lateral line. Fins yellow.

The Andamans.

*P. BANKANENSIS*, Bleeker.

B. v.; D.  $1\frac{3}{4}$ ; P. 16; V.  $\frac{1}{2}$ ; A.  $1\frac{2}{3}$   $1\frac{1}{2}$ ; C. 17.

Brownish; two narrow blue lines on the forehead, converging on the snout, and behind carried on to the back. Two more through the eye to the maxilla. A dark blue mark on the opercle. A line of blue spots along the cheeks. Each scale blue-spotted. A white-edged black ocellus below the dorsal, and sometimes a second near the tail.

The Andamans.

*P. LITTORALIS*, Cuv. et Val.

B. v.; D.  $1\frac{3}{4}$ ; P. 18; V.  $\frac{1}{2}$ ; A.  $1\frac{2}{3}$ ; C. 15.

Olive, with vertical or round bluish spots on the scales. A black spot at the beginning of the lateral line, another at the base of the pectoral, and a third at the base of the tail.

The Andamans.

*P. ALBOFASCIATUS*, Schl.

B. v.; D.  $1\frac{2}{3}$   $1\frac{3}{4}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $1\frac{2}{3}$   $1\frac{1}{4}$ ; C. 17.

Dark olive, with bluish spots on the cheeks. A curved blue line below the eye and a broad yellow vertical band below the last dorsal spines. Sometimes a black spot below the last dorsal spines, and a round white-edged one at the base of the pectoral.

The Nicobars.

*P. PUNCTATUS*, Quoy and Gaim.

B. v.; D.  $\frac{1}{12}$ <sup>1</sup> $\frac{1}{14}$ ; P. 16; V.  $\frac{1}{3}$ ; A.  $\frac{1}{13}$ <sup>2</sup> $\frac{1}{14}$ ; C. 15.

Greyish brown, head with irregular bluish white dots, and one on each scale of the body. A black spot, margined anteriorly and superiorly with white, across the last six dorsal rays and is usually continued to the tail. Sometimes a dark spot on the axilla.

The Andamans and Nicobars.

*P. LABIATUS*, Day.

B. v.; D.  $\frac{1}{12}$ <sup>1</sup> $\frac{3}{13}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{1}{13}$ <sup>2</sup> $\frac{1}{17}$ ; C. 17.

Lips very large, thick, covered with papillae and reflected all round the mouth. Brown, lighter on chest. Fins black. Blue spots on some scales of the head, and usually on the scales of the body above the lateral line.

The Andamans and Nicobars.

*GLYPHIDODON*, *Cuvier*.

Body short, compressed. Mouth small. Opercles entire. Teeth compressed.

*G. SORDIDUS*, Forsk.

Chak-mud-dah. Andamans.

B. v.; D.  $\frac{1}{14}$ <sup>1</sup> $\frac{3}{15}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{1}{12}$ <sup>2</sup> $\frac{1}{17}$ ; C. 15.

Yellowish olive, the fins darker. Five bands broader than the interspaces descend from the dorsal fin to the sides, and a sixth, nearly black, crosses the root of the tail. A black spot at the base of the pectoral and a row of black spots across the nape.

The Andamans.

*G. LEUCOPLEURA*, Day.

B. v.; D.  $\frac{1}{13}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{1}{12}$ <sup>2</sup>; C. 15.

Colour brownish, with a dark band from the dorsal to the ventral. Several narrow white vertical bands from the back to belly. A black spot edged with white at the base of the caudal, extending up to the dorsal. Caudal yellowish, dark-edged.

The Andamans.

*G. COCHINENSIS*, Day.

B. v.; D.  $\frac{1}{12}$ <sup>1</sup> $\frac{3}{13}$ ; P. 15; V.  $\frac{1}{3}$ ; A.  $\frac{1}{10}$ <sup>2</sup> $\frac{1}{11}$ ; C. 15.

Purplish black, lighter below. Pectoral fins paler than the others.

*G. NOTATUS*, Day.

B. v.; D.  $\frac{1}{13}$ <sup>1</sup> $\frac{3}{14}$ ; P. 19; V.  $\frac{1}{3}$ ; A.  $\frac{1}{13}$ <sup>2</sup> $\frac{1}{14}$ ; C. 17.

Olive brown, paler below. Five narrow white bands from the back to the sides. A black spot at the base of the pectoral. Caudal yellowish.

*G. BENGALENSIS*, Bloch.

B. v.; D.  $\frac{1}{12}$ <sup>1</sup> $\frac{2}{13}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{1}{11}$ <sup>2</sup> $\frac{1}{12}$ ; C. 15.

Dull greenish olive, with seven vertical dark bands from the back. A dark edge to spinous dorsal. A dark spot at base of pectoral, and two dark bands along the anal.

The Andamans.

*G. ANTIJERIUS*, Cuv. et Val.

B. v.; D.  $\frac{1}{12}$ <sup>1</sup> $\frac{3}{13}$ ; P. 17; V.  $\frac{1}{3}$ ; A.  $\frac{1}{12}$ <sup>2</sup> $\frac{1}{13}$ ; C. 17.

Colour very variable, sometimes the markings absent. Cerulean blue above the lateral line. Dorsal with or without black blotches. A blue line on the eye, which joins its fellow across the snout. A median blue line along the occiput. Two blue bands along the eye, and another from the eye to gape. Cheeks and suborbital bones blue-lined.

The Andamans.

*P. LEUCOGASTER*, Bleeker.

B. v.; D.  $12^{1-2}_{1-3}$ ; P. 17; V.  $\frac{1}{2}$ ; A.  $12^{2-3}_{1-2}$ ; C. 17.

Olive brown, paler on the sides and yellowish on the belly. Upper edge of dorsal and outer two-thirds of anal black, the rest and the ventrals yellow. Outer margin of caudal dark. A black spot at the base of caudal.

The Nicobars.

*G. MOBESTES*, Schl.

B. v.; D.  $1\frac{1}{2}$ ; P. 18; V.  $\frac{1}{2}$ ; A.  $12^{2-3}_{1-2}$ ; C. 15.

Yellowish olive, paler below. The outer third of dorsal and anal fins greyish. A brownish dot superiorly at the base of pectoral.

The Andamans.

HELIASIES.

Opercles entire. Teeth conical, in a narrow and irregular row.

*H. LEPIDURUS*, Cuv. et Val.

*Glyphidion anabatoides*, Day.

B. v.; D.  $1\frac{1}{2}$   $1\frac{1}{2}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $12^{2-3}_{1-2}$ ; C. 17.

Olive, each scale with a blue dot. A blue line from the eye across the preorbital. A blue spot at the beginning of the lateral line. Dorsal black-edged and blue dotted. Anal dark-edged and yellow-dotted. A brownish band along either caudal lobe. A dark axillary spot on the pectoral. Ventrals green.

The Andamans.

### Family Labridæ.

Branchiostegals 5 or 6. Pseudobranchiæ. Gills  $3\frac{1}{2}$ . Teeth in jaws. Palate edentulous. Lower pharyngeal bones ankylosed along the median line, with no median suture. A single dorsal. Body oblong, compressed (save in *Cheilod*).

The individuals of this family are brightly-coloured, strong-toothed fishes, which frequent coral reefs.

a. *Inferior pharyngeal teeth not confluent or pavement-like.*

*CHEILODS*, *Ruppell*.

Snout obtuse. The 4 anterior teeth conical and free, the lateral ones confluent into a bony ridge. Scales large. Cheeks high, covered with small scales.

*C. ANCHORAGO*, Bloch.

B. vi.; D.  $2\frac{2}{3}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{3}{2}$ ; C. 14.

Cheeks brownish, shot with yellow and scarlet-spotted. Back brown, with a white vertical band between the dorsal and pectoral. A light band at the base of the tail. Dorsal fin with two dark bands and a third which descends to the back. It is edged with yellow behind and orange above. Other fins yellowish. Grows to a large size.

The Andamans.

*LABROIDES*, *Bleeker*.

Snout pointed. A notch anteriorly in one of the lips. A band of small teeth on the jaws, which each have a pair of canines, the upper fitting between the lower. A posterior canine tooth.

*L. DIMIDIATUS*, Cuv. et Val.

B. v.; D.  $\frac{9}{10-12}$ ; P. 13; V. 1; A.  $\frac{3}{10}$ ; C. 14.

White, with a black band to the caudal, with a bend just before that fin. A black band from the anal to caudal, joining the last. Dorsal dark-banded.

The Andamans.

*CHEILINUS*, *Cuvier*.

Teeth in one row. A pair of canines in both jaws, but no posterior canine.

*C. CHLORURUS*, Bloch.

B. v.; D.  $\frac{10}{9}$ ; P. 11; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 12.

Olive brown, with round yellow spots on the cheeks, and a yellow streak from the eye to the gape. Body sparingly yellow-dotted. A yellow mark on the soft dorsal. Spinous dorsal olive, with red edges. Soft dorsal reddish. Anal, ventral, and caudal yellow-dotted.

The Andamans.

*C. TRILOBATUS*, Lacép.

B. v.; D.  $\frac{10}{9}$ ; P. 12; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 13.

Greyish brown, with red spots, and narrow stripes on the head. Vertical fins green, the dorsal and anal with red margins. A dark spot at the base of the middle dorsal rays. Grows to 3 feet.

The Andamans.

*EMBELUS*, *Cuvier*.

Mouth very protractile. Teeth as in *Cheilinus*.

*E. STRIATUS*, Day.

B. v.; D.  $\frac{9}{10}$ ; P. 11; V.  $\frac{1}{2}$ ; A.  $\frac{3}{8}$ ; C. 13.

Greenish brown, with five narrow milk-white vertical bands. A white line between the orbits, another joining them, and a third from the eye to the snout. Fins dark, save the soft dorsal and the anal terminally, which are white.

The Andamans.

*ANAMPSES*, *Cuvier*.

Teeth in one row, the anterior pair above, and below projecting forwards and compressed with cutting edges. No posterior canine.

*A. CERULEO-PUNCTATUS*, Rüpp.

B. vi.; D.  $\frac{9}{12}$ ; P. 12; V.  $\frac{1}{2}$ ; A.  $\frac{3}{12}$ ; C. 13.

Reddish brown, several bluish *vertical* (sic) lines radiate from the orbit. Each scale on the body with a blue spot darkly annulated, fins reddish, the dorsal with three rows of blue spots, the anal and caudal likewise blue-spotted.

The Andamans.

*HEMIGYMNUS*, *Günther*.

Lips very fleshy, the lower notched, the lateral segments pendant. Teeth much as in *Labroides*. Scales large, but a strip of very small ones on the cheek.

*H. MELAPTERUS*, Bloch.

*Labrichthys bicolor*, Day.

B. vi.; D.  $\frac{9}{11}$ ; P. 13; V.  $\frac{1}{2}$ ; A.  $\frac{3}{10}$ ; C. 15.

A posterior canine usually concealed by the skin. Bluish, above brown, yellowish below. A dark mark behind the orbit. Scales blue-dotted. Caudal dark.

The Andamans.

*STETHOJULIS*, *Günther*.

A posterior canine, but no anterior ones.

*S. STRIGIVENTR*, Bennett.

B. vi.; D.  $\frac{1}{11}$ ; P. 15; V.  $\frac{1}{1}$ ; A.  $\frac{3}{11}$ ; C. 11.

Light brown, yellowish on the belly. A brown band, edged below with white from the snout below the eye to the opercle. Several longitudinal yellow lines and black dots along the sides. A black spot on the last dorsal ray, and another at the base of the tail.

The Andamans and Nicobars.

*PLATYGLOSSUS*, *Günther*.

Anterior teeth conical, erect. A posterior canine. Head scaleless.

*P. NOTOPHIS*, Bleeker.

B. vi.; D.  $\frac{1}{13}$ ; P. 13; V.  $\frac{1}{1}$ ; A.  $\frac{3}{12}$ ; C. 11.

Purplish brown, with 4 or 5 red longitudinal bands. Two black ocelli on the dorsal fin, encircled by a light ocellus, and followed by two rows of light spots. Caudal with a yellow band at its base, and yellow edges.

The Andamans.

*P. MYRILH*, Bleeker.

B. vi.; D.  $\frac{1}{17-18}$ ; P. 14; V.  $\frac{1}{1}$ ; A.  $\frac{3}{12}$ ; C. 14.

Olive above, white below. Two brownish-black longitudinal bands, the upper ones united over the snout, the lower commences at the snout and ends at the tail in a black spot. It is interrupted on the opercle by a bright red spot. Two rows (or three posteriorly) of spots along the dorsal fin. Pectoral with a dark spot superiorly at its base.

The Andamans.

*P. MARGINATUS*, Rüpp.

B. vi.; D.  $\frac{1}{12-13}$ ; P. 13; V.  $\frac{1}{1}$ ; A.  $\frac{3}{11}$ ; C. 15.

Blackish green. Head and anterior part of body with undulating grass-green streaks, edged with blue. The vertical fins blue-edged, and with numerous blue-edged streaks and spots. A large vertical green crescentic mark, light-spotted, on the middle of the caudal. Basal half of pectoral black.

The Andamans.

*P. LEPARENSIS*, Bleeker.

B. vi.; D.  $\frac{1}{12}$ ; P. 14; V.  $\frac{1}{1}$ ; A.  $\frac{3}{12}$ ; C. 15.

Body vertically banded. A silvery line from the eye to tail, and below it 4 or 5 more. Many scales brown-spotted. Dorsal with 1 or 2 rows of light round spots, and 2 black ocelli, with sometimes a third caudal one. Caudal yellowish-red.

The Andamans.

*P. NOTULANUS*, Lacép.

B. vi.; D.  $\frac{1}{11-12}$ ; P. 15; V.  $\frac{1}{1}$ ; A.  $\frac{3}{11}$ ; C. 15.

Yellowish-brown. Broad bluish oblique bands on the head and fore parts, and bluish spots. A yellow spot or two below the fourth dorsal spine, and sometimes a black spot behind. Dorsal obliquely brown streaked. A black spot in the axilla, another on the tail, which may be brown-spotted or banded.

The Andamans.

*P. KAWAKIX*, Bleeker.

B. vi.; D.  $\frac{1}{11}$ ; P. 14; V.  $\frac{1}{1}$ ; A.  $\frac{3}{11}$ ; C. 14.

A bluish band from eye to snout, another from the gape to the top of the head, and a third from the interopercle. A blue blotch on the opercle, and a wide blue band above. Top of head blue-spotted. Below the lateral line blue, each scale with a central rosy spot forming seven longitudinal bands. Dorsal and anal fins blue, with three rows of reddish spots, and a median black spot. Caudal yellowish, dark-edged.

The Andamans.

*P. SCAPULARIS*, Bennett.B. vi.; D.  $\frac{1}{11}$ ; P. 15; V.  $\frac{1}{3}$ ; A.  $\frac{3}{11}$ ; C. 15.

A broad red, blue-edged band from the snout to the eye. A second irregular one goes from the eye, obliquely upwards to the lateral band, which is a brownish violet, and goes from the shoulder to the tail. A red streak from the axilla to belly. Many of the body scales blue-spotted. Dorsal and anal margined with a green blue-edged band. Caudal transversely barred with reddish-violet.

The Andamans.

*JULIS*, *Cuvier et Valenciennes*.

Anterior teeth conical, no posterior canine. Scales large, head scaleless.

*J. LUNARIS*, L.B. vi.; D.  $\frac{1}{11}$ ; P. 14; V.  $\frac{1}{3}$ ; A.  $\frac{2}{11}$ ; C. 14.

Head violet, with several oblique reddish bands. Body green, each scale with a vertical red streak, forming bands. An oblong reddish-violet spot on the pectoral. Dorsal red, with a blue and yellow margin. Anal violet with a yellow edge. Caudal yellow, its base and lobes green.

The Andamans.

*J. HERRAICUS*, Lacép.B. vi.; D.  $\frac{1}{11}$ ; P. 14; V.  $\frac{1}{3}$ ; A.  $\frac{2}{11}$ ; C. 15.

Greenish, each scale with a dark vertical mark. A violet dark-edged band from the eye downwards, a second to the base of the pectoral and a third up to the occiput. A dark spot on the pectoral. In the young there is a dark-edged buff band from the first two dorsal spines to behind the ventral, and a dorsal ocellus.

The Andamans.

*J. PURPUREA*, Forsk.B. vi.; D.  $\frac{1}{11}$ ; P. 16; V.  $\frac{1}{3}$ ; A.  $\frac{3}{11}$ ; C. 14.

Green or blue, with or without pink or red bands radiating from the eye. A red or pink band from the opercle to the tail. Another of a brownish-violet along the back to the upper margin of the caudal. A third along the belly to its lower margin, and sometimes a fourth from the chest to the anal fin. Caudal rays green, its web red and violet. Dorsal green or yellow, with a blue-edged pink band along its middle, and sometimes a black spot anteriorly. Anal green, with a dark basal band.

The Andamans.

*J. JANSENII*, Bleeker.B. vi.; D.  $\frac{1}{11}$ ; P. 15; V.  $\frac{1}{3}$ ; A.  $\frac{2}{11}$ ; C. 14.

Yellowish, with 3 to 5 wide black vertical bands down the sides, often wider than the interspaces. A violet streak from the opercle, to the base of the pectoral fin. Pectoral, ventral, and anal fins yellowish, the last with a black spot at the extremity of its last two rays.

The Andamans.

*GOMPHOSUS*, *Lacépède*.

Snout produced, tubiform. Anterior teeth conical. No posterior canine. Gill membranes attached to the isthmus. Scales large, head scaleless.

*G. PECTORALIS*, Quoy and Gaim.B. vi.; D.  $\frac{1}{11}$ ; P. 15; V.  $\frac{1}{3}$ ; A.  $\frac{2}{11}$ ; C. 14.

Reddish-brown, lighter on the belly; each scale darkest at its base. Cheeks pinkish. A dark band from the snout, through the eye. Pectorals yellow. Vertical fins dark, edged lighter. Ventrals whitish, the outer ray brown. A row of round transparent spots along the base of the anal fin.

The Andamans.



b. *Teeth in the pharyngeals confluent and pavement-like.*

*Pseudobax*, Bleeker.

One pair of upper and two pairs of lower incisors, broad, and with cutting lateral edges. An enlarged row of scales at the base of the caudal fin.

*P. Moleucanus*, Cuv. et Val.

B. vi.; D.  $1\frac{1}{2}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{3}{4}$ ; C. 14.

Teeth green, each outer lower incisor recurved. Colour brownish-red, paler on the belly, most of the body scales with a dark spot. Dorsal and anal basally yellow, the former with black reticulated lines and a blue margin. Anal with 2 to 4 dark undulating bands, and a dark blue-margined outer edge. Caudal brown, with a blue posterior edge, and dark banded vertically.

The Nicobars.

*Calliodon*, Cuvier et Valenciennes.

Teeth in both jaws anteriorly compressed and imbricated in 1 row above, and 2 below, and laterally soldered into one deep-cutting lamina. Anterior nostril with a barbel-like prolongation. Scales large.

*C. viridescens*, Rüpp.

B. vi.; D.  $\frac{1}{15}$ ; P. 13; V.  $\frac{1}{2}$ ; A.  $\frac{2}{3}$ ; C. 13.

Colour variable. Brown, marbled and spotted with darker, or green, with dots on the sides, and red streaks on the snout. A black base to the pectoral, and a black spot between the first and second dorsal spines seem pretty constant. In some the colour is olive above, and white below, and most of the scales with a brick-red centre, and white spots. Head and middle of body with red spots, dark, with dark centres. Some red lines on the head, and a pale lateral line to the root of the tail. Dorsal and caudal with reddish-yellow spots. Anal with a black edge, and 2 inosculating red bands inclosing white spots. Ventrals white. Pectorals yellow.

The Andamans.

*Pseudoscarus*, Bleeker.

The upper lip projecting, and double for its whole length. The anterior teeth soldered together, and ranged quincuncially. Scales large. Enlarged scales at the base of the caudal fin.

*P. æruginosus*, Cuv. et Val.

B. v.; D.  $\frac{9}{10}$ ; P. 14; V.  $\frac{1}{2}$ ; A.  $\frac{3}{4}$ ; C. 13.

Olivaceous, with 3 longitudinal silver bands along the belly, below the pectoral fin.

The Andamans.

*P. rivulatus*, Cuv. et Val.

B. v.; D.  $\frac{1}{10}$ ; P. 14-15; V.  $\frac{1}{2}$ ; A.  $\frac{3}{4}$ ; C. 13.

Green, each scale with a reddish base. Snout and cheeks with undulating green lines on a reddish ground. A narrow green band along the base of the dorsal, with an intermediate row of spots. Anal green, edged with darker. Caudal with green spots.

The Andamans.

*P. erythron*, Cuv. et Val.

B. v.; D.  $\frac{9}{10}$ ; P. 15; V.  $\frac{1}{2}$ ; A.  $\frac{3}{4}$ ; C. 13.

Purplish brown, the scales darker at their margins. The enlarged caudal scales dull yellowish. A violet tint in the thoracic region. Snout greenish yellow. Vertical fins brown. The dorsal black-margined. Pectoral transparent.

The Andamans.

## Order ANACANTHINI.

Family **Gadidæ**.

Pseudobranchiæ none, or glandular and rudimentary.

BREGMACEROS, *Thompson*.

Branchiostegals 7. Teeth in jaws minute and movable, also on vomer, none on palate. Two dorsal fins, the anterior one consisting of a single elongated ray rising from the occiput, the second and anal having each a central dwarfed portion, almost forming a distinct fin.

B. ATRIPINNIS, *Tickell*.

B. vii.; D. 1: 20 + xv. + 22; V. 6; A. 22 + 10 + 26; C. 17.

Lower jaw rather the longer. The single dorsal ray reaches from the summit of the head to the extremity of the pectoral. Colour rich brown, lighter below. Ventrals dirty brown, the other fins black.

Coast of Burma and the Andamans.

Family **Pleuronectidæ**.

Pseudobranchiæ well developed. Body flattened, with one of its sides only coloured. Both eyes placed on the coloured side, except in the very young. A single long dorsal and anal fin. Air-vessel none.

In the very young of the '*Pleuronectidæ*' or 'flat fish' the eyes are symmetrical as in all other vertebrata; but the horizontal fins being too weak to sustain the body vertically, it is forced to rest on the ground. The inferior eye under these conditions undergoes displacement, carrying with it the surrounding cartilaginous framework of the skull. The terms '*right*' and '*left*' (*dextral* and *sinistral*) applied to these fishes refer to the coloured side, the fish being placed with its tail towards the observer, the dorsal fin upwards, and the anal downwards. As food these fish occupy the highest rank for wholesome and fine flavour. Reversed individuals occasionally occur.

PSEUDORHOMBUS, *Bleeker*.

Branchiostegals 6. Eyes to the left, without a free orbital edge. Interorbital space not concave. Jaws and dentition nearly symmetrical. Teeth in both jaws of unequal size, and in a single row. Vomer, palate and tongue edentulous. Lateral line strongly curved anteriorly.

P. ARSIUS, *Ham. Buch*.

B. vii.; D. 71-79; P. 11-12; V. 6; A. 51-61; C. 17.

Reddish brown, usually covered with variously-sized rings, and often two dark ocelli, on the straight portion of the lateral line. Grows to a foot.

The Andamans.

PLATOPHYRUS, *Savainson*.

Branchiostegals 6. Eyes to the left. Interorbital space concave. Jaws and dentition nearly symmetrical. Teeth minute. Lateral line strongly curved anteriorly.

P. PANTHERINUS, *Rüpp*.

B. vi.; D. 85-91; P. 10; V. 6; A. 65-70; C. 18.

Purplish-brown, with 3 dark spots along the middle of the body, besides scattered ones elsewhere, also some dark rings. Vertical fins, with brown spots, and white dots.

The Andamans.

SOLEA, *Klein*.

Eyes to the right, the upper in advance of the lower. Dentition most developed on the blind side, where the teeth are in villiform rows. Vomer and palate edentulous.

a. *Nostrils on blind side not dilated. Pectorals developed.*

S. *HETERORHINA*, Bleeker.

B. vi.; D. 87·94; P. 8; V. 4; A. 78·82; C. 16.

Rich brownish-olive, with irregular vertical bands, blotches, and spots edged with black.

*ACHIRUS*, *Cuvier*.

Branchiostegals 6. Eyes to the right, the upper in advance of the lower. Teeth minute, and only on the blind side. Pectorals none.

A. *FAVONINUS*, Lacép.

B. vi.; D. 64·70; P. 2·4; V. 5; A. 50·56; C. 15.

Greyish-brown, covered with milk-white spots of various shapes and sizes, edged with black, and some with a black central dot.

The Andamans.

This is probably the '*Tenasserim sole*,' of which Mason records that the natives consider that they swim in pairs, "with their flat uncoloured sides united."

*SYNAPTURA*, *Cantor*.

Branchiostegals 6. Eyes to the right, the upper in advance of the lower. Teeth minute, on the left side only. Palate edentulous.

a. *The right pectoral the longest.*

S. *ORIENTALIS*, Swainson.

B. vi.; D. 62·65; P. 7; V. 5; A. 47·50; C. 16.

Nasal tube simple. The right pectoral longer than the left. No enlarged scales over the nape. Bluish slate, with short narrow black vertical bands crossing the lateral line; occasionally some white marks. Vertical fins dark; outer half of pectoral black.

S. *PAN*, Ham. Buch.

B. vi.; D. 57·60; P. 7; V. 6; A. 43·45; C. 14.

A patent nostril in front of lower eye, and a tubular one anterior to it. Nostril on blind side concealed. Scales on the nape enlarged. Dull red, or muddy brown or grey with irregular vertical black blotches or bands. Right pectoral black.

Coast of Burma.

*CYNOGLOSSUS*, *Hamilton Buchanan*.

Branchiostegals 6. Eye to the left. Snout prolonged and curved downwards and backwards. Mouth narrow and unsymmetrical. Teeth minute, on the right side only. Lateral line on the coloured side, double or triple. Pectorals none.

C. *BRACHYRHYNCHUS*, Bleeker.

B. vi.; D. 106; V. 4; A. 78; C. 12.

Two nostrils, a patent one between the eyes, and a tubular one in front of the lower eye. No right ventral. Two lateral lines on the coloured side separated by 17 or 18 rows of scales. A single one on the blind side.

Maulmain, in brackish water.

C. *BENGALENSIS*, Bleeker. (Var. ?)

B. vi.; D. 105; V. 4; A. 68; C. 15.

Eyes small, contiguous. Two lateral lines on the coloured side, divided by 14 rows of scales, 1 on the blind side. Brown, vertical fins spotted and edged with black.

The Sittoung River.

C. *LIDA*, Bleeker.

B. vi.; D. 99·104; V. 4; A. 75·83; C. 12.

Nostrils as in *Brachyrrhynchus*. Two lateral lines on the coloured side, separated by 13 rows of scales where most distant. A single one on the other. Brownish, with a dark mark on the opercle.

Burma.

#### Order PHYSOSTOMI.

##### Family Siluridæ.

Subopercle absent. Margin of upper jaw formed by the premaxillaries. Skin covered with scales, or bony plates or tubercles.

The *Siluridæ* or 'cat fishes' (so-called from their whiskers, or barbels) are fond of muddy water, and from disuse, the eyes in many species, which inhabit muddy water, seem to suffer from a sort of atrophy, and cease growing in the usual ratio. Some of the fishes of this family (*Charias* and *Succobranhus*) are amphibious breathers, like the *Ophiocephali*, and require access to the atmospheric air, else they become drowned if unable to rise to the surface. The air-vessels of some marine species yield a coarse isinglass. The spines inflict severe wounds and are much dreaded, as they are regarded as poisonous. Wounds caused by the spines are undoubtedly painful and angry.

A. *Air-vessel not inclosed in bone.*

a. *A posterior adipose dorsal fin.*

MACRONES, *Duméril*.

Mouth terminal, transverse. Eyes with free circular lids. Barbels 8 (2 nasal, 2 maxillary, 4 mandibular). A distinct and separate interneural shield on the nape, closely connected to the basal bone of the dorsal fin. In some species wanting. Villiform teeth in jaws and palate. Dorsal fin with 1 spine and 7 rays. Pectoral with a strong serrated spine. Ova small.

M. *lon*, Ham. Buch.

Ngā-gyoung. Burma.

B. xii.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{2}$  10; V. 6; A. 12·13; C. 17.

Upper jaw the longer. The maxillary barbels extend to beyond the base of the caudal, the nasal half-way to the orbit, the outer mandibular one to the pectoral, and the inner two-thirds as far. Dorsal spine as long as the head, finely serrated behind. Colour plumbeous above, whitish below. Fins yellowish, externally stained dark. A black spot, the size of the eye, on the dorsal. Grows to 3 feet.

Burma.

M. *Blythii*, Day.

D.  $\frac{1}{2}$  0; P.  $\frac{1}{2}$ ; V. 6; A. 12; C. 17.

Snout projecting. The maxillary barbels, which are the longest, only reach the anterior margin of the orbit. A dark spot on the shoulder, and another at the base of the adipose dorsal. Body indistinctly banded.

The Tenasserim provinces.

M. *gilio*, Ham. Buch.

B. ix.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{2}$  9; V. 6; A. 12·15; C. 17.

Top of head granulated. The nasal barbels shorter than the head. The maxillary reach to nearly the end of the ventral fin. The outer maxillary barbels longer than the head, or the inner ones. Dorsal spine half as long as the head, serrated behind and with one or two teeth before. Lurid bluish brown above, dull white below. Fins usually black.

Burma.

M. *microphthalmus*, Day.

Ngā-aik.

B. x.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{2}$ ; V. 6; A. 12; C. 17.

Snout spatulate. Top of head smooth. Dorsal spine very slender, only osseous at its base. Upper caudal lobe with a filamentous prolongation. Light brown, shot with purple. Fins darkest externally.

The Irrawaddy River.

*M. CAVASIUS*, Ham. Buch.

Ngā-zyn-zēng.

B. vi.; D.  $\frac{1}{2}$ 0; P.  $\frac{1}{8}$ ; V. 6; A. 11-13; C. 16.

Snout obtuse. The nasal barbels nearly as long as the head. The maxillary extend to beyond the base of the caudal fin. The external mandibular to almost the base of the ventral, the internal as long as the head. Dorsal spine weak, entire. Pectoral internally denticulated. Colour plumbeous above, yellowish on the belly and cheeks. Dorsal and caudal dusky, the other fins dull white. Grows to  $1\frac{1}{2}$  feet.

Burma.

*M. VITIATUS*, Bloch.

Ngā-zyn-yaing.

B. x.; D.  $\frac{1}{2}$ 0; P.  $\frac{1}{9}$ ; V. 6; A. 9-12; C. 17.

Top of head roughened. The maxillary barbel reaches the ventral fin; the nasal, the opercle; the outer mandibular, to the first third of the pectoral spine, whilst the inner is shorter. Dorsal spine half as long as the head, finely serrated behind. Pectoral spine strong, with 16 coarse denticulations. Colour variable. Silvery or golden. Aged specimens (in Madras) have a light bluish lateral band with a paler one above and below. A dark shoulder spot, and another sometimes at the base of the caudal fin. Sometimes the fish appears dark with 5 longitudinal silvery bands. Tops of fins dark. Grows to 8 inches.

Burma.

*M. LEUCOPHYSIS*, Blyth.

Ngā-pet-lek and Ngā-nouk-thwā.

B. xi.; D.  $\frac{1}{2}$ 0; P.  $\frac{1}{8-10}$ ; V. 6; A. 11-12; C. 17.

Snout rounded. Top of head rather rugose. The nasal barbels just reach to the middle of the eye; the maxillary to the anal fin; the outer mandibular to the middle of the pectoral fin, and the inner to the gill openings. The dorsal spine finely serrated behind in its upper fourth. Purplish-black, with some white dots on the body. Grows to a foot or more.

Tenasserim.

*M. BLEEKERI*, Day.

B. x.; D.  $\frac{1}{2}$ 0; P.  $\frac{1}{8-10}$ ; V. 6; A. 9-10; C. 17.

Snout obtuse. Top of head, opercle, occipital bone and humeral process granulated. The nasal barbels reach the hind edge of eye; the maxillary ones, the anal fin; the outer mandibular, to the base of the pectoral; the inner ones a little less. Dorsal spine entire. Pectoral spine longer than dorsal and denticulated. Brownish grey, with two light longitudinal bands below the lateral line. Sometimes a dark shoulder spot, and a dark median band on the anal fin.

Burma.

*ERETHRISTES*, *Müller et Troschell*.

Head osseous superiorly, somewhat depressed. Mouth small, terminal, or sub-inferior. Eyes small, sub-cutaneous, without a free orbital margin. Nostrils close together, separated by a barbel. Barbels 8, the maxillary ones with broad bases. Villiform teeth in jaws, palate edentulous.

*E. HARA*, Ham. Buch.

Ngā-kyouk-hpā. Burma.

D.  $\frac{1}{2}$ 0; P.  $\frac{1}{2}$ ; V. 6; A. 10-11; C. 15.

Blunt spinate ossicles in skin. The pectoral spine denticulated internally, and serrated externally; each alternate tooth directed anteriorly or posteriorly. Caudal rays not elongated. Yellowish-brown, banded or blotched with darker. Fins black-banded. Barbels annulated with black. Grows to  $5\frac{1}{2}$  inches.

Burma.

E. CONTA, Ham. Buch.

Ngā-the-y-tō and Ngā-kyouk-thwā.

Skin tuberculated. The pectoral spine denticulated internally, and backwardly serrated externally. Upper caudal ray elongated. Coloured as *E. kara*, save the mandibular barbels are not annulated.

Burma, as far south as Tenasserim.

RITA, Bleeker.

Branchiostegals 8. The mouth transverse, upper jaw the longer. The nostrils on either side contiguous to each other, but widely separated from those on the other. Eyes subcutaneous, and without free circular margins. Barbels 6, a minute pair at the posterior nostrils, a maxillary and a mandibular pair. Teeth villiform in both jaws, and molariform teeth in the mandible as well, and on the palate. Ova larger than in *Macrurus*.

R. SACERDOTUM, Anderson.

Upper half of body brownish olive, more or less suffusing the ventral surface, behind the ventral fins. Fins brown on both aspects. Eye a transverse ellipse margined with golden, the scleritic being brownish golden. Grows to 5 feet, and inhabits the Irrawaddy River, about Thingadaw pagoda, where the fish readily assemble at the call of "tit-tit," and are so tame as to allow themselves to be freely handled, according to Dr. Anderson, and even allow the hand to be introduced into their mouths.

R. BUCHANANI, Bleeker.

Ngā-litwē.

B. viii.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{2}$  6; V. 8; A. 12-13; C. 19.

Top of head covered with skin, except a strip anterior to the base of the occipital process. Teeth villiform above, and the outer and anterior ones in the mandible. Two or three rows of inner mandibular teeth rounded and larger posteriorly. The maxillary barbels nearly reach the end of the head, the mandibular are a little shorter. Dorsal spine very strong and slightly serrated behind in its upper portion. Air-vessel large, thick, quadrangular, posteriorly bicurved, and bipartite. Colour lurid green, paler below. Grows to 4 feet.

The Irrawaddy River.

ARATUS, Curier.

Head above osseous, or covered with very thin skin. Eyes mostly with free orbital margins. Anterior and posterior nostrils placed close together, the latter valvular. Barbels 6, 1 maxillary, and 2 mandibular pairs. Villiform teeth on jaws, villiform or globular on palate and sometimes the vomer. Eggs larger than in *Rita*.

Fish of this genus are inferior as food, but are largely salted and afford a coarse isinglass. Day describes the remarkable habit possessed by the males of this genus of hatching the ova in their mouths. "I found many males, also of *Osteogeniosus*, with 15 to 20 of them in their mouths. Some of the eggs were in an early stage of development, others nearly ready to be hatched, while in the mouth of one specimen was a hatched fry, having the yolk-bag still adherent. The eggs filled the cavity of the mouth, and extended far back to the branchiæ. Whether the male carries about these eggs in his mouth till hatched, or only removes them when danger is imminent from some spot where he is guarding them, is questionable; but in none of the specimens which I examined, did I find a trace of food in the intestines of the males, which had been engaged in this interesting occupation."

a. *Villi-form teeth on the palate.*

A. BURMANICUS, Day.

Ngā young. Burma.

B. vi.; D.  $\frac{1}{2}$ 0; P.  $\frac{1}{10}$ ; V. 6; A. 19-20; C. 15.

Eyes without free orbital edges. Snout spatulate. The maxillary barbels do not quite reach the base of the pectoral fin. The outer mandibular are nearly as long. Dorsal spine strong, serrated on both edges. Pectoral spine like the dorsal, but stronger. Purplish, dashed with copper. Dull white below. Dorsal fins stained black externally. Grows to a foot at least, and strongly resembles *Macroules aor*.

Tidal rivers in Burma (Maulmain and Bassein).

A. CILIATUS, Cuv. et Val.

*A. equibarbis*, Cuv. et Val.

B. vi.; D.  $\frac{1}{2}$ 0; P.  $\frac{1}{5}$ ; V. 6; A. 19; C. 15.

The maxillary barbels reach the middle of the pectoral fin, the outer mandibular ones are a fifth shorter. Dorsal spine very strong, granulated laterally and anteriorly. Serrated behind, its whole length, and superiorly in front. Bluish along the back and sides, white on the belly. Adipose dorsal black. End of dorsal, ventral, and pectoral fins black. Grows to a large size.

Burma (Maulmain).

A. ACUTIROSTRIS, Day.

B. v.; D.  $\frac{1}{2}$ 0; P.  $\frac{1}{10}$ ; V. 6; A. 19; C. 17.

Snout fleshy and elongate, mouth inferior. Barbels short, the maxillary reach beyond the hind edge of the eye. Dorsal spine strong, serrated on both sides. Upper portion of dorsals black, the other fins grey. Grows to a foot or more.

The Salween River.

A. SUMATRANUS, Bennett.

D.  $\frac{1}{2}$ 0; P.  $\frac{1}{10}$ ; V. 6; A. 18-19; C. 17.

Scattered granulations on the top of head. The maxillary barbels reach the end of the head, the outer mandibular ones as far as the base of the pectoral fin. Dorsal spine serrated on both edges. Bluish green above, paler below. Edges of fins stained grey. Very little black on adipose dorsal.

The Andamans.

A. VENOSUS, Cuv. et Val.

B. vi.; D.  $\frac{1}{2}$ 0; P.  $\frac{1}{10}$ ; V. 6; A. 18-19; C. 17.

Scattered granulations on the top of head. The maxillary barbels extend to the base of the pectoral fin, the outer mandibular ones are shorter. The dorsal spine is serrated posteriorly, and for its anterior upper half, the lower half being granulated.

Burma.

This species has a much shorter head than *A. sumatranus*.

A. THALASSINUS, Rüpp.

B. vi.; D.  $\frac{1}{2}$ 0; P.  $\frac{1}{12}$ ; V. 6; A. 15-17; C. 17.

Top of the head granulated. The maxillary barbel reaches to the end of the pectoral; the outer mandibular are a little shorter. Dorsal spine granulated in front, serrated behind. Pectoral spine shorter than the dorsal, rough externally, fully serrated internally. Silvery, darkest above, the upper half of the adipose dorsal black. Sometimes the colour is a rich brown, the granules on the head tipped with gold.

The Andamans.

b. *Globular teeth on the palate.*

A. BUCHANANI, Day.

B. vi.; D.  $\frac{1}{2}$ 0; P.  $\frac{1}{10}$ ; V. 6; A. 22; C. 17.

Top of the head lined in roughened lines. The maxillary barbels reach to the first third of the pectoral fin, the outer mandibular ones almost to its base. Palatal teeth with large globular heads. Silvery above, lighter below. Pectoral and dorsal edged with blackish behind. A black spot on the adipose dorsal.

The Irrawaddy River.

A. GAGORA, Ham. Buch.

B. vi.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{10}$ ; V. 6; A. 18; C. 17.

Upper jaw the longer. Most of the occiput and the whole of the occipital process granulated. Median groove on the head narrow and deep. The maxillary barbels less than the head; the outer mandibular ones reach to the gill opening. Palatal teeth globular, in large semi-ovate patches. Purplish above, whitish below. Air-vessel five-chambered. Grows to  $1\frac{1}{2}$  feet or more (3 feet, *file* H. B.).

Burma.

A. JATIUS, Ham. Buch.

Ngā-young or Ngā-yeh.

B. vi.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{10}$ ; V. 6; A. 18; C. 17.

Summit of head sparingly granulated behind. The maxillary barbels shorter than the head; the outer mandibular ones just reach the gill-opening. Palatal teeth on a small patch, which may be absent. Dorsal spine strong, serrated on both sides. Dark bluish above, paler below. Fins yellowish. Upper edge of dorsal deep black. A deep black spot on the upper half of the adipose dorsal. Caudal black-edged. Anal with a dark marginal spot. Grows to a foot or more.

Burma, ascending tidal rivers.

BATRACHOCEPHALUS, *Bleeker*.

Lower jaw the longer. Eyelids with a free circular margin. Nostrils approximate, the posterior valvular. Barbels two, rudimentary on the chin. Teeth obtusely conical in two distant rows in either jaw, and a longitudinal band on the palate. None on the vomer. An axillary pore.

B. MINO, Ham. Buch.

B. v.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{2}$ ; V. 6; A. 20; C. 15.

Colour silvery, darkest along the back and upper lobe of caudal fin.

The Irrawaddy River.

This fish is not common and is held in no esteem for food.

KETENGUS, *Bleeker*.

Head bony above. Eyelids with a free circular margin. Upper jaw longest. Barbels 6, small, no nasal ones. Nostrils approximate, the posterior valvular. A single row of compressed teeth, palate edentulous. An axillary pore.

K. TYPUS, *Bleeker*.

B. v.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{7}$   $\frac{1}{12}$ ; V. 6; A. 19·20; C. 15.

Colour silvery.

The Andamans.

OSTEOGENIOSUS, *Bleeker*.

A thin skin over the head. Upper jaw the longer. Nostrils approximate, the posterior valvular. A single pair of semi-osseous maxillary ones. Teeth on the jaws villiform, on the palate obtusely conical. An axillary pore.

O. MILITARIS, L.

B. v.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{10}$   $\frac{1}{11}$ ; V. 6; A. 19·22; C. 17.

Barbels rather longer than the head. Silvery, darker above. Fins tinged with red. Grows to 14 inches or more.

Burma, entering rivers.



*O. STENOCEPHALUS*, Day.

B. v.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{2}$ ; V. 6; A. 20; C. 17.

Barbels as long as the head. Silvery, darkest above. Maulmain.

*PANGASICUS*, *Curier et Valenciennes*.

Upper jaw the longer. Eye with a free orbital margin. Nostrils apart; both patent, the anterior situated on the upper edge of the snout. Barbels 4, one pair maxillary and one pair behind the chin. Villiform and conical teeth mixed in the jaws. One or more axillary pores.

*P. BUCHANANI*, Day.

B. ix. x.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{2}$ ; V. 6; A. 31-34; C. 19.

The maxillary barbels reach the base of the pectoral fin; the mandibular ones are half as long as the head. Silvery, darker on the back, and glossed with purple on the sides. Cheeks and under surface of the head shot with gold. Grows to 4 feet.

Burma, in tidal rivers.

*PSEUDEUTROPICUS*, *Bleeker*.

Head covered with a soft skin. Nostrils patent, equidistant. Barbels 8, one nasal, one maxillary, and two mandibular pairs, these last commencing in a transverse line close to the hind edges of the lower lip. Teeth villiform in jaws and palate. A very small adipose dorsal. An axillary pore generally present.

*P. GOONGWARILL*, Sykes.

B. vi.; D.  $\frac{1}{2}$  10; P.  $\frac{1}{2}$ ; V. 6; A. 54; C. 17.

The nasal barbels reach to the dorsal, the maxillary to the anal, and the mandibular ones are about as long as the head. Dorsal spine slender, very finely serrated behind. Pectoral fins stronger, longer, and strongly denticulated inside. Silvery, darkest above. Grows to about a foot.

Burma.

*P. ACUTIROSTRIS*, Day.

B. vi.; D.  $\frac{1}{2}$  0; P.  $\frac{1}{2}$ ; V. 6; A. 42-46; C. 17.

Eyes without adipose lids behind the gape. Top of head flat and rugose. Upper jaw elongated and projecting. The nasal barbels longer than the head, the mandibular as long, the maxillary reach to the base of the anal fin. The whole of the under surface of the snout toothed, the premaxillaries being entirely in advance of the lower jaw. Silvery, a black spot on the occiput and a black blotch at the base of the dorsal fin. The elongated snout appears not to be constant or even usual, as Day observes: "The common form has no elongation of the snout, although of the same size as the one having such an elongation, but otherwise the same."

The Irrawaddy and other large rivers of Burma.

In one specimen a long anal papilla was present. This species is the Burmese representative of *P. atherinoides* of India.

*P. GURUA*, Ham. Buch.

B. vi.; D.  $\frac{1}{2}$ ; P.  $\frac{1}{2}$ ; V. 6; A. 29-36; C. 17.

Eye situated partly on the lower surface of the head, having a broad, circular, adipose lid. Upper jaw the longer. Nasal barbels half, or nearly so, as long as the head; the maxillary extend to the middle or end of the ventral fin, while the two mandibular ones are as long as the head. Silvery, fins stained with grey. Grows to 2 feet or more.

The larger rivers of Burma.

*OLYRA*, *MacClelland*.

Body elongate and low, with horizontal dorsal profile. Head depressed. Nostrils remote from one another, the posterior provided with a barbel. Barbels 8. Eyes small. Villiform teeth in the jaws and palate. Skin smooth.

O. BERMANICA, Day.

D. 8.0; P. 4; V. 7; A. 16; C. 17.

The maxillary barbels longest, extending nearly to the base of the ventral fin. No dorsal spine, its first ray the shortest. Colour dark brown.

Streams in the Pegu Yoma.

b. *No second or adipose dorsal fin.*

CALICHROUS, *Hamilton Buchanan.*

Head covered with skin. The lower jaw the longer. Eyes subcutaneous, behind the gape. Barbels 4, a maxillary pair, and a post-symphysial pair on the mandible, sometimes rudimentary or absent. Nostrils remote from one another. Teeth villiform on jaws and vomer, none on the palate. No axillary pore.

Fishes of this genus are excellent eating. They rarely exceed a foot in length and are called "butter fish" by Europeans, and "puffa" in Oorloo.

a. *Anal and caudal fins united.*

b. *Anal fin distinct from the caudal.*

C. PABO, *Ham. Buch.*

B. xii; D. 5; P.  $\frac{1}{14}$ ; V. 9.10; A. 66.71; C. 17.

The maxillary barbels reach the hinder edge of the eye, or a little further, the mandibular ones are fine and short. Pectoral spine feebly serrated, or entire in Burma. Silvery, with an indistinct shoulder spot.

Burma.

C. MACROPHthalmus, *Blyth.*

Ngā-nu-thān.

B. xv.; D. 4; P.  $\frac{1}{12-15}$ ; V. 8; A. 69.73; C. 18.

The maxillary barbels reach to the eighth or tenth anal ray, the mandibular ones are half as long as the head. Caudal deeply forked. Silvery, a dark round shoulder spot over the middle of the pectoral spine.

Burma.

WALLAGO, *Bleeker.*

Head covered with soft skin. Snout produced, the lower jaw a little the longer. Eyes above the line of the gape. Nostrils apart, the posterior small and patent, the anterior slightly tubular. Barbels 4, one maxillary and one mandibular pair. Teeth numerous, cardiform in jaws and vomer, none on the palatines. Axillary pore minute, if present.

W. ATTU, *Bloch.*

Ngā-bāt, Burma.

B. xix. xxi.; D. 5; P.  $\frac{1}{13-15}$ ; V. 8.10; A. 86.93; C. 17.

Eyes with free lids. The maxillary barbels twice as long as the head, the mandibular ones as long as the snout. Colour uniform, fins sometimes finely punctate. It grows to at least 6 feet and is good eating.

Burma.

SILURUS, *Artedi.*

Head covered with soft skin. Eyes above the line of the gape, subcutaneous. Nostrils remote from one another. Barbels 6, 1 pair maxillary, 2 mandibular. Teeth cardiform or villiform on jaws and vomer, none on the palatines. Anal and caudal fins approximate, but not continuous.

S. COCHINCHINENSIS, *Chr. et Val.*

B. xiv. xv.; D. 4; P.  $\frac{1}{17}$ ; V. 10; A. 62.64; C. 17.

Eyes minute. The maxillary barbels twice the length of the head, the mandibular shorter than it. Colour plumbeous, purplish below, and minutely black-punctate, sometimes an irregular finger mark on the shoulder. Caudal sometimes yellow.

Arakan. Tenasserim.

c. *Two rayed dorsals.*

CHACA, *Curier et Valenciennes.*

Head large, depressed. Gape very wide. Lower jaw prominent. Eyes minute, subcutaneous, and superior. One maxillary and two mandibular pairs of barbels; occasionally a nasal pair. Teeth villiform in both jaws, palate edentulous. Two dorsal fins, the second confluent with the caudal. Two anal fins, the second confluent with the caudal. No axillary pore.

C. LORRINOES, Ham. Buch.

B. vi.; D.  $\frac{1}{3}$  19·25; P.  $\frac{1}{2}$ ; V. 6; A. 8·10; 8·12; C. 11.

Brownish, darker marbled. Grows to 8 inches.

The larger rivers of India and Burma, and tanks near them.

Hamilton Buchanan says of this fish, "Of all the horrid animals of this tribe, the *Chaka* of this district is the most disagreeable to behold. It has the habit of the fishes called by Lacépède *Tramuscopé* and *Cotté*, that is, it conceals itself among the mud, from which, by its lurid appearance, and a number of loose filamentous substances on its skin, it is scarcely distinguishable, and with an immense open mouth it is ready to seize any small prey that is passing along. In order that it may see what is approaching, the eyes are placed on the crown of the head. All persons turn away from it with loathing."

The "filamentous substances," to which Buchanan seems to have taken such exception, are doubtless the short tentacles over the head and body, round the eyes, and along the mandible, which are present in specimens from India, but which were wanting in a specimen taken by Day in the Irrawaddy.

PHOTOSIS, *Lacépède.*

Head depressed, covered with skin. Eyes with a free circular margin. Nostrils remote from one another, the hinder patent, the anterior tubular, and on the front edge of the snout. Barbels 8. Teeth conical in the upper, mixed in the lower jaw, molariform in the vomer. Dorsals 2, the last confluent with the caudal, as in the anal also. A dendritic post-anal apparatus.

P. CANICS, Ham. Buch.

B. xi·xiii.; D.  $\frac{1}{2}$  2 D + C + A. 212·271; P.  $\frac{1}{10}$  1·17; V. 12.

Brown, the vertical fins edged with black. Grows to over 3 feet.

Estuaries of Burma.

B. *Air-vessel more or less inclosed in bone.*

1. *No adipose dorsal fin.*

CLARIAS, *Gronovius.*

A dendritic accessory branchial apparatus, attached to the convex side of the second, third, and fourth branchial arches, is received into a recess above and behind the usual gill cavity. Eyes small, with a free circular margin. Barbels 8. Teeth villiform in the jaws and vomer. Dorsal long, and without a spine, extending from the neck to the caudal, with which it may be continuous. No adipose fin. Air-vessel small, transverse, lobed, and inclosed in bone.

*Vertical fins not confluent with the caudal.*

C. MAGUR, Ham. Buch.

Ngā-khu.

\* B. ix.; D. 62·76; P.  $\frac{1}{8}$  1·17; V. 6; A. 45·58; C. 15·17.

Head shagreened above, with fine granules. On the head are 2 depressions, the anterior oblong, falling partly between the eyes, the posterior oval between the anterior fossa and the occipital process. Dinky green, or brownish above, lighter below. The vertical fins usually with reddish margins. Grows to  $1\frac{1}{2}$  feet.

Burma.

It lives long after being removed from water, and its flesh is esteemed highly nourishing.

SACCOBRANCHIUS, *Cuvier et Valenciennes*.

Gill cavity with an accessory posterior sac, extending backwards on either side of the neural spines amongst the muscles of the abdominal and part of the caudal region. Head depressed. Eyes with a free circular margin. Barbels 8. Air-vessel placed transversely across the bodies of the anterior vertebra, where it is inclosed by bone; a duct passes up from either side of the air-vessel, unites and opens into the inferior surface of the pharynx. Dorsal short, spineless. Ventral short. Anal long.

S. FOSSILIS, Bloch.

Ngā-gyi.

D. 6·7; P.  $\frac{1}{2}$ ; V. 6; A. 60·79; C. 19.

Anal and caudal separated by a notch. Colour plumbeous, with sometimes two longitudinal yellowish bands. The young sometimes reddish. Eggs pea-green. Grows to a foot or more.

Rivers and ponds in Burma.

Wounds from the pectoral spine of this fish are horribly dreaded by the fisherman, as they are supposed to be poisonous and to cause tetanus; the spines are therefore invariably broken off on capture. Its flesh is highly esteemed for its invigorating properties, and tanks are often stocked with this fish in consequence.

## 2. *An adipose dorsal fin.*

SILUNDIA, *Cuvier et Valenciennes*.

Body elongated and compressed. Eyes lateral, with narrow adipose lids. The nostrils on either side approximating, the anterior pair in front of the snout and a little external to the posterior pair. A pair of maxillary and sometimes a pair of mandibular barbels. Villiform teeth on the jaws and in an uninterrupted band on the palate. An axillary pore. Air-vessel reniform, convex before, lying across the body of an anterior vertebra, with the aorta between, and having its lateral margin protected by bone.

S. GANGETICA, Cuv. et Val.

D.  $\frac{1}{2}$ ·0; P.  $\frac{1}{12}$ · $\frac{1}{12}$ ; V. 6; A. 40·46; C. 17.

Barbels a single pair of minute maxillary ones.

Bluish above, silvery below. Fins stained with grey. Grows to 6 feet or more. The larger rivers of Burma and India.

EUTROPICHTHYS, *Bleeker*.

Body and head compressed. Head covered with a soft skin. Eyes with broad adipose lids. Gape deep, upper jaw slightly the longer. Nostrils wide and patent, the anterior outermost and lateral. Barbels 8. Teeth on jaws sharp, and also on the vomer and palatines. Air-vessel tubiform, lying across the body of an anterior vertebra, with the aorta intervening and protected by bone. No axillary pore.

E. VACUA, Ham. Buch.

Var. BURMANICUS, Day.

Kā-tha-boung and Ngā-myen-kōn-bān.

B. xi.; D.  $\frac{1}{2}$ ·0; P.  $\frac{1}{12}$ · $\frac{1}{12}$ ; V. 6; A.  $\frac{3}{4}$ · $\frac{1}{4}$ ; C. 17.

The nasal barbels reach the hind edge of head or further. Maxillary ones as long as the head. The mandibular ones shorter. Ventral reaches half-way to the anal. Silvery, greyish along the back. Pectoral and caudal usually black-edged.

*AMBLYCEPS, Blyth.*

Head covered with soft skin. No thoracic adhesive disk. Eyes small, subcutaneous. Mouth anterior, gape wide. Nostrils close together, the posterior with a barbel. Villiform teeth in jaws, palate edentulous. Pectoral with a concealed spine. Air-vessel almost entirely inclosed in bone. No axillary pore.

*A. mangois*, Ham. Buch.

B. xii.; D. 2.0; P.  $\frac{1}{2}$ ; V. 6; A. 9-12; C. 19.

Nasal and inner mandibular barbels as long as the head. The maxillary reach to the end of the pectoral spine, and the outer mandibular ones are not quite so long. Olive brown, lighter beneath. In some a dark line from opposite the opercle, divides, one band going to the caudal, the other to the base of the anal. Grows to 5 inches.

Hill streams from Afghanistan to Burma. (Maulmain.)

*GAGARA, Bleeker.*

Top of head with sharp longitudinal ridges covered with thin skin. Eyes subcutaneous. Snout overhanging the mouth. Nostrils close together, the anterior rounded, the posterior valvular. Barbels 8. Villiform teeth in jaws, palate edentulous. Air-vessel in two rounded portions, each of which is inclosed in an osseous cup.

*G. GENIA*, Ham. Buch.

Ngā-man-joung.

B. v. vi.; D. 1.0; P.  $\frac{1}{2}$ ; V. 6; A. 14-16; C. 19.

Nasal barbels rudimentary, the maxillary reach to beyond the base of the pectoral spine. The two mandibular pairs rise on a transverse line across the chin, the outer ones half as long as the head. Dull grey. Caudal whitish. The outer two-thirds of the pectoral, and the outer halves of the other fins black. The young are yellowish bronze, silvery below. Blackish barred over the head and body, as low as the lateral line. Caudal and dorsal with black marks. Grows to a foot.

Burma.

*BAGARUS, Bleeker.*

Head depressed, osseous above. Upper jaw the longer. Eyes with free margins. Nostrils approximating. Barbels 8. Teeth in jaws pointed, of unequal size, palate edentulous. Air-vessel small, its two rounded portions inclosed in bone. An axillary pore.

B. YARELLII, Sykes.

B. xii.; D. 1.0; P.  $\frac{1}{2}$ ; V. 6; A. 13-15; C. 17.

The maxillary barbels with broad bases, and longer than the head. The nasal pair short. Teeth sharp and unequal in the jaws, with an outer enlarged row in the mandible. Grey or yellowish, with irregular brown or black markings and cross-bands. A black base to all the fins. Grows to 6 feet or more.

This fish is sometimes called a fresh-water shark, as is the *Silaulia*. Mason specifies a large eat fish which may apply to either or both.

*GLYPTOSTERNUM, MacClelland.*

Head depressed, covered with soft skin. Eyes small, subcutaneous. Mouth inferior, upper jaw the longer. Nostrils close together, separated by a barbel. Barbels 8. Villiform teeth in jaws, palate edentulous. An adhesive apparatus of longitudinal plaits between the pectorals.

*G. TRILINEATUM, Blyth.*

D. 2.0; P.  $\frac{1}{2}$ ; V. 6; A. 13; C. 19.

The maxillary barbels reach to the end of the head, the nasal pair nearly to the orbit. The inter-mandibular barbels the longer, and reaching to the base of the pectoral fin. Colour chestnut-brown, with a light streak along the back, another along the lateral line and a third near the abdominal margin. Grows to a foot.

Burma, as far south as Tenasserim.

*EXOSTOMA, Blyth.*

No thoracic adhesive apparatus. Mouth inferior, lips reflected and tubercular. Nostils close together, separated by a barbel. Teeth in several rows. Palate edentulous.

E. BERDMOREI, Blyth.

D. 3.0; P. 3.0; V. 6; A. 6; C. 14.

The maxillary barbels reach the base of the pectoral fin. Dingy olive brown, with obscure dark broad bands, the fins usually darker.

Tenasserim.

*Family Scopelidæ.*

Pseudobranchiæ well developed. No barbels. Two dorsal fins, the posterior adipose. Ova inclosed in sacs in the ovaries and extruded by oviducts. Air-vessel small or absent.

*HARPAGON.*

Premaxillaries from the margin of the upper jaw. Caudal trilobed. Thin and deciduous scales over the last three-fourths of the body.

H. NIGRETS, Ham. Buch.

Bammaloh, or 'Bombay duck.'

B. xxiii.xxvi.; D. 12.13; 0; P. 11.12; V. 9; A. 13.15; C. 19.

Body compressed. Snout short. Lower jaw the longer. Teeth recurved and erectile. In both jaws there are 3 rows of teeth, the outer minute, the inner the largest, and largest in the mandible. Teeth in 2 rows on the pharyngeals and palatines. Fine teeth on the tongue, hyoid bone and the upper margin of the branchial arches. The first dorsal is midway between the snout and tail. The point of the ventral reaches to the middle of the anal; a long thin elongated scale at its base. Head, back, and sides, semitransparent, like gelatine. Light greyish, with minute stellate black dots. Anterior part of the belly pale silvery bluish, the rest greyish-white. Fins transparent, like the body, but more closely dotted. Grows to 16 inches.

These fish when freshly caught and at once cooked are not unjustly esteemed the most delicate of any in the East. They are better known, however, in the dried state made up into bundles, and are then toasted brown with a little cayenne pepper on them, and handed round with curry, to which they impart a subemphyreumatic flavour of dried fish, a strong liking for which is soon acquired. These 'Bombay ducks' as they are called are a standing dish at breakfast, on board the coasting steamers, and are very nice; but it is as well not to watch their being brought up from the store room by a naked 'lascar' afflicted perhaps with a cutaneous disease, and who, with a bundle of these delicacies under his naked arms, stops ever and anon for a quiet scratch!

*Family Scombresocidæ.*

Pseudobranchiæ concealed, glandular. Margin of the jaw formed mesially by the premaxillaries, laterally by the maxillaries. Lower pharyngeals united into a single bone.

B. STRONGYLURUS, v. Hasselt.

Thook-o-doo-noo-dah. Andamans.

B. xii.; D. 13.15; P. 11; V. 6; A. 16.18; C. 15.

A shallow median groove on the top of the head. Teeth on the jaws sharp, straight, not large, distant. Back and crown of head yellowish green, minutely brown-dotted, silvery on the sides, cheeks and opercles, white on the belly. A deep blue lateral band posteriorly, with a broader silvery one below it. Dorsal with a little orange

along its upper edge. Pectoral and ventral diaphanous, the latter with sometimes a black spot at the base. Caudal yellowish or greenish, minutely black-dotted and with a bluish-black spot at its base.

The Andamans.

BELONE, *Cuvier*.

Both jaws elongated into a beak. No finlets. Bones green.

B. CANCELA, Ham. Buch.

Ngā-phoung-yo.

B. x.; D. 15-18; P. 11; V. 6; A. 16-18; C. 15.

A deep longitudinal groove along the top of the head. A row of large sharp distant teeth on both jaws, with an external row of fine ones, none on the vomer. Greenish grey above, whitish along the belly. A dark-margined silvery streak from the orbit to the tail. The upper two-thirds of the body closely marked with five black spots, with four or five larger blotches between the bases of the pectoral and anal fins. Dorsal and caudal fins tipped behind with darker. Eye golden.

Ta-goung.

HEMIRHAMPHUS, *Cuvier*.

The lower jaw only elongated into a beak.

H. UNIFASCIATES, Ranzani.

B. x.; D. 15-16; P. 12; V. 6; A. 15-17; C. 16.

Teeth fine and numerous in both jaws. Bluish, with a narrow silvery band.

The Andamans.

H. LIMBATUS, Cuv. et Val.

B. x.; D. 13-14; P. 10; V. 6; A. 13-15; C. 14.

Teeth minute, in many rows in both jaws, trienspidate. The lower caudal lobe the longer. A brilliant silvery lateral band posteriorly, as broad as one scale. Dorsal and top of tail sometimes blackish.

Burma, in tidal rivers.

H. BUFFONIS, Cuv. et Val.

Koo-door-rook-o-dah. Andamans.

B. xi.; D. 14; P. 10; V. 6; A. 10-12; C. 13.

A barbel at the posterior nostril. Teeth conical in both jaws. Lower rays of caudal slightly produced. A narrow silvery lateral streak, less than a scale broad, below the dorsal. Upper half of dorsal black.

The Andamans, and tidal rivers.

H. ECRUXETIO, Ham. Buch.

Ngā-phoung-yo.

B. x.; D. 13-14; P. 9; V. 6; A. 10-12; C. 15.

Upper jaw twice as long as its base is broad. Top of head flat. Teeth fine and conical. Anal rays thickened in the male. Caudal rounded. Scales on the upper jaw, none on the vertical fins. Dull greenish-brown, with an indistinct lateral band. End of upper jaw milk white.

Akyab and Burma.

H. DISPAR, Cuv. et Val.

B. x.xi.; D. 11-12; P. 10; V. 6; A. 11-12; C. 15.

Upper jaw as long as it is broad at the base. A nasal barbel. Caudal cut square, or slightly rounded. Scales on the upper jaw, none on the dorsal or anal fins.

The Andamans.

EXOCETUS, *Arctedi*.

Pectorals elongated, so as to form an organ for flying. Air-vessel large.

E. LYGIANS, L.

D. 12-14; P. 14; V. 6; A. 13-15; C. 17.

Interorbital space flat. Caudal lobed, the lower much the longer. Six and a half rows of scales between the origin of the dorsal fin and the lateral line. Bluish along the back, lighter below. Pectoral grey or black, with a light edge. Grows to 9 inches. The Andamans.

### Family Cyprinodontidæ.

Pseudobranchiæ absent. Barbels none. The margin of the upper jaw formed solely by the premaxillaries. Teeth in both jaws and on the pharyngeal bones.

HAPLOCHILUS, *MacClelland*.

Upper surface of nape and head broad and depressed. Mandibular rami united at the symphysis. Teeth villiform.

H. MELASTIGMA, *MacClelland*.

B. iv.; D. 6-7; P. 15; V. 6; A. 20-21; C. 15.

Lower jaw slightly the longer, the maxilla does not quite reach to the front edge of the eye. Teeth minute. Dull green above, dull white below. Outer portion of anal rays white-edged. A narrow dark line along the middle of the side, terminating in a dull spot at the base of the caudal. Grows to 6½ inches.

Burma.

H. PANCHAX, *Ham. Buch.*

Ngā-saki, Arakan. Choto-dah, Andamans.

B. v-vi.; D. 7-11; P. 15; V. 6; A. 15-17; C. 13.

Lower jaw rather the longer; the maxilla reaches to the first third of the eye. A row of enlarged teeth in the upper jaw, and a broad band on the vomer. A white occipital spot. Upper surface greenish, below dull white. Fins yellowish, the lower third of the dorsal covered by a large black spot. Dorsal, caudal, and anal, orange-margined. Ova very large.

Burma and the Andamans.

### Family Cyprinidæ.

Branchiostegals 3. Margin of the upper jaw formed of the premaxillaries. Mouth toothless, but one to three rows of teeth in the inferior pharyngeal bones. Head scaleless (in Indian species).

A. *Belly rounded, not trenchant.*

A. *Dorsal fin commencing nearly opposite the ventrals. Anal short.*

HOMALOPTERA, *v. Hasselt*.

Head and body anteriorly depressed, snout spatulate. Mouth small, inferior, with two pair of rostral and one of rictal barbels. Pharyngeal teeth small, 5 to 16 in one row.

H. BILINEATA, *Blyth*.

B. iii.; D. 10; P. 17; V. 9; A. 7; C. 19.

Snout pointed, upper lip fimbriated. Eyes small. Air-vessel none. Brownish, with a wide dark chestnut band from the snout to the tail.

Tenasserim.

DISCOGNATHUS, *Heckel*.

Body elongated, subcylindrical. Mouth transverse, semicircular and inferior. Upper and lower lips continuous. A suction disk on the chin formed on the lower lip. Upper lip fringed. Barbels 4, a rictal pair on each side. Air-vessel small.



D. LAMPA.

B. iii. ; D. 11 ; P. 15 ; V. 9 ; A. 7 ; C. 17.

Snout very variable, smooth, or covered with pores, with sometimes a deep transverse depression, sometimes with a spinate gland on either side. Greenish, with a bluish-green band along the centre of the body, extending along the middle of the tail. Generally a dark spot behind the gill opening. Belly yellowish-green. Fins yellowish, tipped with black.

Tenasserim.

LABRO, *Cuvier*.

Body moderately elongated. Mouth generally semioval and inferior. Lips thick, continuous at the gape, and one or both with an inner transverse fold. A soft and movable horny covering with a sharp margin on the inner side of one or both lips. Snout rounded, projecting, tubercular, sometimes laterally lobed. Pharyngeal teeth in 3 rows.

L. NARDINA, Ham. Buch.

Ngā-ōng-dōng. Ngā-ni-pyā.

B. iii. ; D. 24-26 ; P. 15 ; V. 9 ; A. 7 ; C. 19.

Snout slightly projecting with a few fine pores on it. Lips thick and fringed, and a distinct inner fold above and below. Barbels 4, short. Ventral inserted below the ninth dorsal ray. Caudal deeply forked. Dark greenish above, paler below. A few cloudy blotches on the side. Some of the scales with red centres.

Burma. (The Irrawaddy, Maulmain, etc.)

L. CALBAC, Ham. Buch.

Ngā-neck-pyā. Ngā-nu-thān. Ngā-ōng-dōng.

B. iii. ; D. 16-18 ; P. 19 ; V. 9 ; A. 7 ; C. 19.

Snout obtuse and depressed, without lateral lobe, but with pores. Lips thick, fringed, and each with an inner fold. Barbels 4. Ventral commences below the fourth or fifth dorsal ray. Blackish. When caught in clear streams, many of the scales have a scarlet centre. Fins black, tip of caudal sometimes white above. Grows to 3 feet, and is good eating.

Burma.

L. STOLICZKE, Steindachner.

B. iii. ; D. 15-16 ; P. 19 ; V. 9 ; A. 7 ; C. 19.

A deep groove across the chin, with a distinct labial fold. Upper lip very finely fringed. Pores on the snout. A very short pair of maxillary barbels concealed in the labial fold. Deep leaden-silvery above, white shot with gold below.

Irrawaddy River and Maulmain.

L. GOMUS, Ham. Buch.

Nga dien, Nga-hoo (Ngā-pay, Tenasserim).

B. iii. ; D. 16-18 ; P. 17 ; V. 9 ; A. 7 ; C. 19.

Snout with numerous pores. Lips thick, with a distinct inner fold for their entire circumference, both of which are fringed. A cartilaginous covering to inner side of both jaws. Barbels short, both maxillary and rostral. Ventral commences under the middle of the dorsal.<sup>1</sup> Caudal deeply forked. Greenish above, lighter below. Scales dark-edged and many with red crescentic spots. Grows to nearly 5 feet in length.

Burma.

L. KOHITA, Ham. Buch.

Ngā-myt-chyn, Nga-myt-tsan-nee.

B. iii. ; D. 15-16 ; P. 17 ; V. 9 ; A. 7 ; C. 19.

<sup>1</sup> In the figure cxxvii. l. 1, the ventral is a little in advance of this.

Snout scarcely swollen, but projecting beyond the jaws. Lips thick, fringed, and with a distinct inner fold above and below. A short and thin pair of maxillary barbels, and sometimes a rostral pair. Ventrals inserted below the third or fourth dorsal ray. Caudal deeply forked. Bluish or brownish above, silvery on the sides and belly. Scales sometimes red-spotted. Fins sometimes black.

Grows to 3 feet, and is excellent eating.

Burma.

L. ANGRA, Ham. Buch.

Ngā-loo.

B. iii.; D. 12-13; P. 16; V. 9; A. 7; C. 19.

Snout overhanging the jaws, with lateral lobes, and studded with pores. Lips continuous, finned, and with a deep groove across the chin. A short pair of maxillary barbels, or in Burmese examples, in place thereof, is a fleshy flap inside the groove. Ventrals inserted beneath the first third of the dorsal. Caudal deeply forked. Brownish above, with a black blotch at the base of the tail.

The Irrawaddy and Sittoung Rivers.

L. BOGA, Ham. Buch.

Kyauk-nya-loo.

B. iii.; D. 11-13; P. 16; V. 9; A. 7; C. 19.

Snout projecting, but no lateral lobes, sometimes covered with large pores. Lips rather thick, the lower being reflected from off the mandible and roughened inside, and with a thin layer of cartilage inside. Orange, with fins reddish, and sometimes a dark shoulder spot. Grows to a foot.

OSTEOCHILUS, *Gunther*.

Mouth directed downwards. Lips thickened, continuous, the lower being reflected from off the mandible, leaving it uncovered, as a sharp and hard transverse prominence.

O. CHALYBEATUS, Cuv. et Val.

Ngā-leh.

B. iii.; D. 20; P. 18; V. 9; A. 7; C. 19.

Snout overhanging, without lateral lobes. Barbels 4. The maxillary pair half as long as the orbit, the rostral ones shorter. Grey above, lighter below, with narrow dark lines along the body. Fins black.

The Irrawaddy and Salween Rivers.

O. NEILLI, Day.

B. iii.; D. 17-18; P. 15; V. 9; A. 7; C. 19.

Snout rounded and smooth, scarcely overhangs. The rostral barbels do not reach the orbit, the maxillary extend to beneath its centre. Colour greyish-yellow, darker above, each scale darker at its base. A dull spot at the base of the tail and an ill-defined one near the commencement of the lateral line. Fins yellowish orange. Grows to 6 inches.

The Sittoung and Beeling Rivers.

O. CEPHALUS, Cuv. et Val.

B. iii.; D. 16; P. 20; V. 9; A. 9; C. 19.

Snout swollen, projecting, and with many pores. The mandible has a transverse free edge, with thick lips, both the upper and lower fringed. One short pair of maxillary barbels. Greenish, the scales darker at their base. Grows to 1 foot.

Pegu.

DANGILA, *Cuvier et Valenciennes*.

Snout moderately depressed and obtusely rounded. Mouth transverse, inferior. Lower jaw sharp, covered with a thin lip and with a symphyseal tubercle. One maxillary and mandibular pair of small barbels.

D. BURMANICA, Day.

B. iii.; D. 26-28; P. 16; V. 9; A. 7; C. 19.

Upper caudal lobe the longer. Silvery, some of the scales with dark spots at their base, forming horizontal bands. Fins orange. Grows to 10 inches.

Maulmain and Tavoy.

D. BERDMOREI, Blyth.

B. iii.; D. 26; V. 9; A. 7.

Large pores on front of snout. Lower lip thick, not fringed. Colour (in spirit) uniform.

Tenasserim.

CIRRHINA, *Cuvier et Valenciennes*.

Snout depressed, obtusely rounded, with soft covering extremely thin. Mouth broad, transverse. Upper lip not continuous with the lower. Lower jaw sharp, with a thin lip, or none, and a small tubercle over the symphysis.

C. MRIGALA, Ham. Buch.

Ngā-kyin and Ngā-gyein.

B. iii.; D. 15-16; P. 15; V. 9; A. 8; C. 15.

Dorsal commences nearer to the snout than to the tail. Silvery, dark grey along the back, sometimes having a coppery tinge. Pectoral, ventral, and anal fins orange, stained with black. Grows to three feet, and is an excellent species for stocking tanks with.

Burma.

SEMILOTUS, *Bleeker*.

Snout thick and prominent. Mouth wide, transverse, inferior, with a knob at the symphysis. No barbels. Dorsal long, its last undivided ray strong.

S. MODICUS, Day.

B. iii.; D. 24; P. 15; V. 9; A. 9-10; C. 19.

Several open pores on either side of the snout. A thin cartilaginous covering to the mandible. The last undivided ray of the dorsal is serrated. Silvery, darkest above. Ventrals and anal tipped with orange.

Akyab in hill streams.

S. MACCLESLANDII, Bleeker.

B. iii.; D. 27-28; P. 16; V. 10; A. 9; C. 19.

Snout thickened, with a line of 6 open pores crossing it towards the orbit. A horny covering to the mandible. Leaden silvery, darkest above, the pectoral, ventral and anal fins orange. Grows to 2 feet.

Burma.

CATLA, *Cuvier et Valenciennes*.

Head broad. Snout with very thin integuments. Lower lip thick, with a continuous and free posterior margin. Upper lip none. The mandible with a movable symphyseal articulation, but no tubercle. Barbels none.

C. BUCHANANI.

Ngā-thaing.

B. iii.; D. 17-19; P. 21; V. 9; A. 8; C. 19.

Lower jaw prominent, in large fish some pores on the snout. Greyish on back. Silvery on the sides and belly. Fins dark. Grows to 6 feet.

Burma.

This fish is good for stocking tanks, and up to 2 feet its flesh is excellent, larger fish are rather coarse.

AMBLYPHARYNGODON, *Bleeker*.

Mouth wide. Lower jaw prominent. Upper lip none, and only a short labial fold along the mandible. No barbels. Pharyngeal teeth molariform. Scales small.

A. ATKINSONII, *Blyth*.

Ngā-pān-mā.

B. iii.; D. 9-10; P. 15; V. 9; A. 8; C. 19.

Dorsal and abdominal profile similar. Silvery, with a golden gloss over the head.

Burma and Upper Burma.

A. MOLA.

Ngā-leh-hpyoo and Ngā-zen-zāp.

B. iii.; D. 9; P. 15; V. 9; A. 7; C. 19.

The dorsal profile more convex than the abdominal. A silvery lateral band, and dark markings on the fins.

Burma.

BARBERS, *Cuvier et Valenciennes*.

Mouth arched. Jaws closely invested by the lips. Eyes without adipose lids. Pharyngeal teeth. Barbels present.

A. *Four barbels present.*

A. *Last undivided dorsal ray ossaceous and serrated.*

B. SARANA, *Hann. Buch.*

Ngā-khōn-mā-gyi and Ngā-chong.

B. iii.; D. 11; P. 15; V. 9; A. 8; C. 19.

Lower labial fold interrupted. No pores on the snout. The rostral barbels as long as the orbit, the maxillary pair longer. Silvery darkest above; opercles shot with gold. Upper row of scales sometimes horizontally banded. Fins white or yellowish, externally stained with grey. In Burma the caudal is sometimes black-edged. Grows to a foot.

Burma.

B. GONIOSOMA, *Bleeker*.

B. iii.; D. 11; P. 15; V. 8; A. 7; C. 19.

Rostral barbels extend to below the middle of the eye, the maxillary ones to opposite the posterior margin of the orbit. The lower caudal lobe the longer. Silvery, fins orange.

Mergui.

B. MARGARIANUS, *Anderson*.

B. iv.; D. 12; P. 18; V. 9; A. 7; C. 19.

Abdominal profile more convex. Some large open pores on the front and sides of snout. No transverse sulcus across the mandible. Four barbels, the rostral reaching to below the first third, and the maxillary pair to below the last third of the eye. Silvery blue along the back. Sides and belly white. Some of the scales basally dark marked. A black band down the middle of the dorsal fin. Caudal black-margined.

Nampoung River, Kakhien Hills.

B. *Last undivided dorsal ray ossaceous and entire.*

B. STRACHEYI, *Day*.

B. iii.; D. 11; P. 17; V. 9; C. 17.

Mouth without enlarged lips, lower labial fold interrupted. Upper jaw somewhat the longer. Crown of head flat. Barbels long, as in *goniusoma*. Osseous dorsal ray strong and smooth. Uniform silvery.

Akyab. Maulmain.

B. STEVENSONII, Day.

B. iii.; D. 12; P. 17; V. 9; A. 8; C. 19.

Body elongated and compressed. Upper jaw the longer. Lower labial fold interrupted. The maxillary barbels extend to below the posterior extremity of the orbit; the rostrals are shorter. Osseous dorsal ray weak and smooth. Silvery, above darker, numerous black specks along the side, a black spot at the base of the tail, and a dark band along the dorsal fin.

Hills near Akyab.

B. BLYTHII, Day.

B. iii.; D. 12; P. 15; V. 9; A. 8; C. 17.

Preorbital covered with pores. Barbels well developed. Caudal deeply forked. 23 rows of scales between the lateral line and the base of the ventral fin. Uniform silvery (in spirit). Perhaps this species is the young of *B. compressus*.

Tenasserim.

*B. Two barbels present.*

*a. With an osseous dorsal serrated ray.*

B. MACROLEPIDOTUS, Cuv. et Val.

B. iii.; D. 12; P. 17; V. 9; A. 7; C. 19.

Snout pointed, upper jaw slightly the longer. Head compressed, flat above. The maxillary barbels as long as the orbit. Silvery, paler below. Fins orange, anterior edge of the dorsal and outer margins of the caudal black. A badly developed dark band from the dorsal to the ventral fin.

Tavoy.

*b. Osseous dorsal ray entire.*

B. CHOLA, Ham. Buch.

Ngā-không and Ngā-lowah.

B. iii.; D. 11; P. 15; V. 9; A. 7; C. 19.

Jaws equal in front. Barbels short. Silvery, opercles shot with purple and gold. A dark blotch usually exists on the free portion of the tail. A dark mark on the base of the first dorsal rays, and a row of dark spots along its centre. Grows to 5 inches. The flesh is bitter.

Akyab to Mergui.

B. BURMANICUS, Day.

B. iii.; D. 12; P. 15; V. 9; A. 7; C. 17.

Snout pointed, a considerable rise from the snout to the dorsal fin. Maxillary barbels very short. Labial fold interrupted. Silvery, paler below. A dull blotch before the base of the caudal fin. Fins silvery, with a dull band down the centre of the dorsal.

Burma.

*C. No barbels.*

*a. Last undivided ray osseous and serrated.*

B. APOGON, Cuv. et Val.

Ngā-ta-si and Ngā-lē-toung.

B. iii.; D. 12; P. 17; V. 10; A. 8; C. 19.

Body strongly compressed, and rising abruptly from the nape to the base of the dorsal fin. Upper jaw overlaps. Silvery, each scale dark-spotted. Grows to 8 inches.

Mandalay to Tenasserim.

B. STOLICZKANUS, Day.

B. iii.; D. 10-11; P. 14; V. 9; A. 7; C. 19.

Mouth small. Silvery, an oblong black mark on the lateral line about the third scale, and a deep black mark above and behind the hinder extremity of the anal fin, on the eighteenth and nineteenth scales, reaching almost to the back, and edged in front with yellow. Fins orange. Grows to 4 inches.

Darjeeling to Maulmain.

B. FURTUNIO, Ham. Buch.

B. iii.; D. 10-11; P. 15; V. 9; A. 8; C. 19.

Mouth small. Reddish-brown, with a black band from the back to opposite the middle of the pectoral, and another to the end of the base of the anal fin. Two other light bands pass down from either end of the dorsal. A dark band down the centre of the dorsal, and another at the base of the tail. Grows to 3 inches.

Burma.

b. *Ossaceous dorsal ray entire.*

B. STIGMA, Ham. Buch.

Ngā-không-mā.

B. iii.; D. 11-12; P. 17; V. 9; A. 8; C. 19.

Upper jaw slightly the longer. Lower labial fold interrupted. Silvery, with a seasonal scarlet, lateral band, and a dark mark across the base of the middle dorsal rays. A round black blotch at the root of the tail. Grows to 5 inches. The flesh is bitter.

Burma.

B. FURTIO, Ham. Buch.

B. iii.; D. 11; P. 15; V. 9; A. 7; C. 21.

Mouth small. Colour silvery. A wide black band encircles the free portion of the tail, and includes the tip of the anal fin. Dorsal orange, tipped with black. Grows to 3 inches.

Burma.

NURIA, *Cuvier et Valenciennes*.

Mouth narrow, directed obliquely, upwards. Barbels 4, the rostral shorter than the maxillary pair. Dorsal fin without ossaceous rays.

S. DAURICA, Ham. Buch.

Ngā-zyn-byun.

B. iii.; D. 8; P. 15; V. 9; A. 8.

The maxillary barbels reach to the base of the tail, or a little less. A broad black lateral band (sometimes absent). Grows to 5 inches.

Burma. The Nicobars.

RASBORA, *Bleeker*.

Cleft of mouth oblique, lower jaw slightly prominent, having one central and on either side a lateral prominence fitting into emarginations in the upper jaw. Eyes with free lids. Dorsal fin without any ossaceous ray.

R. ELANGA, Ham. Buch.

B. iii.; D. 9; P. 15; V. 8-9; A. 7; C. 19.

Head pointed. One pair of short rostral barbels. Silvery, with sometimes a plumbeous band along the top of the side. Grows to 8 inches.

Burma.

*R. DANICONTUS*, Ham. Buch.

Ngā-donng-zī.

B. iii.; D. 9; P. 15; V. 9; A. 7; C. 19.

No barbels. A black band more or less distinct, from the eye to the tail, and sometimes a silvery band edged above with yellow runs along the sides. Grows to 8 inches.

Burma.

*R. BRENAANI*, Bleeker.

B. iii.; D. 9; P. 15; V. 9; A. 7·8; C. 19.

Abdominal profile more convex than the dorsal. Silvery, with a faint side streak. Caudal tipped with black.

Burma.

*ASPIDOPARIA*, *Bleeker*.

Mouth small, inferior. The lower jaw with a sharp crescentic naked edge. Barbels none. Dorsal fin without osseous ray. Lateral line concave, and passing along the lower half of the base of the caudal fin.

*A. MORAK*, Ham. Buch.

Ngā-hpen-boo and Yen-boong-zā.

B. iii.; D. 9·10; P. 15; V. 8·10; C. 19.

Snout very obtuse. Upper jaw overlaps the lower. A broad suborbital ring of bones covers the cheek. Light brown above, divided from the silvery side by a burnished streak. Grows to 7 inches.

Burma.

*ROHILE*, *Sykes*.

Mouth anterior, lips thin. Dorsal fin with an osseous serrated spine and commencing midway between the ventral and anal fins. Scales small.

*R. CORIO*, Ham. Buch.

Ngā-hpān-mā.

B. iii.; D. 11·12; P. 13; V. 10; A. 29·36; C. 19.

Dorsal profile high. Upper jaw slightly the longer. Barbels none, or rudimentary. Silvery, darkest along the back, and with sometimes a silvery lateral band. Sometimes a black blotch before the tail and another on the nape. Grows to 6 inches.

Burma.

*R. BELANGERI*, *Chr. et Val.*

Ngā-hpeh-oung and Ngā-nek-kyā.

B. iii.; D. 11·12; P. 17; V. 9; A. 20·21; C. 17.

Lower jaw a trifle the shorter. Dorsal profile elevated. Caudal deeply lobed, the lower slightly the longer. Silvery, greyish on the back. Sometimes a dark streak from the shoulder to the base of the pectoral fin. The very young have the tail black-banded. Grows to 15 inches in length.

Burma.

*BARILIUS*, *Hamilton Buchanan*.

Jaws compressed, the lower usually with a symphysial knob fitting into the upper. Suborbital ring of bones usually broad, especially the third. Dorsal fin without osseous spine, and inserted posteriorly to the ventrals.

*B. GUTTATUS*, *Day*.

Ngā-la-wā.

B. iii.; D. 9; P. 15; V. 9; A. 14; C. 17.

Upper jaw the longer. Suborbitals broad, especially the hindmost, which almost covers the cheek. A rudimentary pair of rostral or maxillary barbels may be present. Caudal forked, the lower lobe slightly the longer. Silvery, shot with purple; one or two rows of blue spots along the side. Lower caudal lobe orange. Upper lobe dark-edged, and a dark submedian band. Grows to 7 inches.

The Irrawaddy River above Prome.

*B. nota*, Ham. Buch.

*B. iii.*; D. 10-11; P. 13; V. 9; A. 13; C. 19.

Head compressed, snout pointed. Suborbital ring of bones wide, especially the third. Barbels none. Silvery, with two or more rows of vertical bluish blotches along the sides. Caudal orange, stained with grey and black. Pectoral, ventral, and anal fins orange. Grows to a foot, and somewhat resembles a 'trout.' It is a very game fish, and takes a fly well.

Burma.

*Danio*, *Hamilton Buchanan*.

Body compressed, belly rounded. Cleft of mouth shallow, directed obliquely upwards, the end of the lower jaw falling within the dorsal profile.

*A. spinosus*, Day.

*B. iii.*; D. 15-16; P. 13; V. 7; A. 19-20; C. 19.

Orbit with an antero-superior spine and a blunter one on the preorbital. A pair of small rostral barbels. Caudal lunate. Silvery, with an ill-defined lateral band and some vertical yellow lines anteriorly. Dorsal and anal greyish, with front margins reddish. In the young a dark shoulder spot and a steel-blue side band posteriorly edged with scarlet. Grows to 4 inches.

Burma.

*D. leucifinnatus*, MacClell.

*B. iii.*; D. 12-14; P. 17; V. 8; A. 14-16; C. 19.

The rostral barbel half as long as the orbit, the maxillary minute. Yellowish white, a broad bluish band from the eye to the tail, and along it several round silvery spots. Below it is another band and above it two paler ones, the intermediate space being yellow. Fins yellowish. Dorsal and anal fins each with an outer bluish band.

Tenasserim.

*D. dangila*, Ham. Buch.

*B. iii.*; D. 11-13; P. 12; V. 7; A. 17-18; C. 20.

Rostral barbels a little shorter than the head, the maxillary slightly longer. Back olive, belly silvery, sides with several narrow blue lines, anteriorly handsomely reticulated. A dark spot behind the gill covers. Anal fin with two or three blue stripes.

Hills about Akyab.

*D. kakhiensis*, Anderson.

*D. 10*; P. 13; A. 14.

Barbels two, equalling half the ocular interspace. Eleven longitudinal rows of scales between the dorsal and ventral margins. A dark lateral line with obscure dusky bands both above and below, the scales minutely punctulated with black, especially along the margins.

The Nampoung River, Kakhyen Hills.

*D. albolineatus*, Blyth.

*B. iii.*; D. 9; P. 13; V. 7; A. 13-15; C. 19.

The maxillary barbels reach beyond the base of the pectoral fins, the rostral ones to the back of the orbit. Greenish above. A scarlet band with a dark lower edge



from the base of the dorsal to the tail, narrowing anteriorly. Dorsal margined with red. Anal with a mesial yellow stripe. Grows to 2 inches.

Maulmain in tanks and streams.

*D. NIGROFASCIATUS*, Day.

B. iii.; D. 9; P. 15; V. 7; A. 13; C. 19.

The maxillary barbels reach to below the orbit. Rostral none. A dark band down the side, and a blue-dotted line below it. Dorsal and anal lineately black-spotted. Sometimes the body is intense blue. Grows to less than an inch in length.

Pegu and Maulmain.

*B. Belly trenchant, wholly, or in part.*

*PERILAMPUS*, *MacClelland*.

Body oblong, compressed, with a trenchant abdominal edge. Mouth directed obliquely upwards. Barbels none. Outer ventral ray elongated.

*P. ATAR*, Ham. Buch.

Ngā-man-dor, or Ye-paw-ngā, or Ngā-hpyin-gyan.

B. iii.; D. 9; P. 10; V. 5·6; A. 22·24.

Body strongly compressed. Elongated ventral ray reaches to nearly the end of the anal fin. Silvery, with a burnished lateral band. Dorsal and caudal fins yellow. Grows to 4 inches.

Burma.

*P. LANCEOLA*, Ham. Buch.

Ngā-mi-loung.

B. iii.; D. 10·11; P. 13; V. 7; A. 19·23; C. 19.

Body strongly compressed. Ventral margin trenchant between the pectoral and anal fins. Silvery, with some golden vertical stripes during life. Fine dots over the body, and a black mark shot with green above the base of the pectoral, and another at the base of the caudal. The posterior third of the tail sometimes black. Tail spot sometimes wanting. Grows to 3½ inches.

Burma.

*CHELA*, *Hamilton Buchanan*.

Body elongate, compressed, with trenchant abdominal edge. Lower jaw prominent, with usually a symphysial knob. Barbels none. No osseous dorsal ray.

*Bones of forearm do not support the edge of thorax.*

*C. SLADENI*, Day.

B. iii.; D. 10; P. 11; V. 8; A. 20·21; C. 21.

Suborbital ring half as deep as the orbit. The serrated ventral margin commences opposite the base of the pectoral fin. The lower caudal lobe the longer. Silvery, caudal black-edged.

The Irrawaddy River.

*C. SARDINELLA*, Cuv. et Val.

Ngā-kwōn-hmyat.

B. iii.; D. 9; P. 13; V. 8; A. 21.

Suborbital ring broad, but does not touch the preopercular ridge. Caudal deeply forked, the lower lobe the longest. Silvery. Grows to 6 inches.

The Irrawaddy and Salween Rivers.

*C. CLUPEOIDES*, Bloch.

B. iii.; D. 9; P. 13; V. 9; A. 13·15.

Suborbital ring wide, four-fifths as wide as the uncovered cheek below. Silvery. Grows to 6 inches and is good eating.

Burma.

*C. BACILLA*, Ham. Buch.

B. iii.; D. 9; P. 13; V. 9; A. 13-15; C. 19.

Suborbital ring broad, nearly covering the cheek. Silvery. Grows to 7 inches. Maulmain (fide Günther).

*Sub-family COBITIDINA.*

Pseudobranchiae none. Body elongated, oblong, compressed or cylindrical, but never depressed. Snout and lips fleshy. Mouth small, inferior, with 6 to 12 barbels. Scales small and much buried in mucus. Air-vessel wholly or partly inclosed in bone.

*A. An erectile spine near the orbit.*

*BOTIA*, Gray.

Eye with a free circular eyelid. Barbels 6 to 8. Four nasal and two maxillary (two mandibular). No scales on the head.

B. BERDMOREI, Blyth.

B. iii.; D. 13-15; P. 13; V. 8; A. 7; C. 17.

The suborbital spine reaches to below the middle of the eye. Barbels six. Buff, with 10 to 12 dark vertical bands from back to belly. Head banded, and a dark line from the eye to the snout. Numerous oblong blotches over the body. Dorsal fin with three or four rows of spots. Caudal and anal also spotted.

The Irrawaddy River and Tenasserim.

B. INSTRIGIOSA, Blyth.

B. iii.; D. 10; P. 15; V. 8; A. 7; C. 19.

Suborbital spine very strong, and reaching to the hinder edge of the orbit. Barbels eight. Olive, with five dark vertical bands over the body and ten over the head. All the fins with two broad brown bars.

Pegu.

*ACANTHOPTERIS*, v. Hasselt.

Body very elongated. Snout long and compressed. Barbels eight, two being mandibular. Orbital spine bifid.

A. CHOIRRHYNCHUS, Bleeker.

Ngā-tha-leh-tō. (Applied to many allied species.)

B. iii.; D. 11; P. 11; V. 7; A. 8; C. 11.

Nostrils nearer the end of the snout than to the orbit. Brownish, with 12 bands across the back, and as many blotches along the lateral line. Two rows of blotches along the dorsal, and three across the anal fins.

Burma.

*LEPIDOCEPHALICHTHYS*, Bleeker.

Barbels 6 to 12, 4 being mandibular. A skinny flap on either side of the mandible, ending in a barbel. Pectoral fin sometimes armed with a flat spine, adapted for digging in the mud, for the purpose of concealment.

L. BERDMOREI, Blyth.

Ngā-tha-lah-tō.

B. iii.; D. 8; P. 10; V. 8; A. 7-8; C. 17.

Barbels 4 rostral, 2 maxillary, and 4 to 6 short mandibular ones. Rich yellowish-brown, with a dark-spotted line along the body. The upper part of the body covered

with fine markings. A black spot at the base of the tail. Dorsal and caudal fins punctately lined.

Maulmain.

*ACANTHOPIHALMUS, v. Hasselt.*

Barbels 6, one rostral and two maxillary pairs. Suborbital spine bifid.

*A. pangio*, Ham. Buch.

B. iii.; D. 8; P. 10; V. 6-7; A. 7; C. 17.

Eyes minute. Caudal entire. Scales distinct. Light cinnamon.

Burma.

*ARVA, Blyth.*

Barbels 8. Two rostral, two maxillary, and four mandibular. Suborbital spine bifid. Ventral fins absent.

*A. rusca*, Blyth.

B. iii.; D. 8; P. 11; V. 0; A. 8; C. 16.

Brownish, with a dark longitudinal band. Grows to 2½ inches.

Pegu.

*B. No erectile orbital spine.*

*NEMACHEILUS, v. Hasselt.*

Dorsal profile nearly horizontal. Barbels 6 (8 in one Indian species). None on the mandible.

*N. EUPHIPPINIS*, Blyth.

B. iii.; D. 15-16; P. 14; V. 8; A. 7; C. 19.

The premaxillary ends in a spine-like process projecting from the middle of the upper lip. The two rostral pairs of barbels reach to below the front edge of the eye. Caudal nearly entire. Scales distinct. Reddish brown, with from 12 to 16 dark irregular bands across the back, ending in dark spots below the lateral line. Dorsal obliquely banded. Caudal vertically banded, and a black ocellus at the upper half of its base.

Tenasserim.

*N. ZONALTERNANS*, Blyth.

B. iii.; D. 11; P. 11; V. 9; A. 7; C. 19.

Scales distinct. Ten or eleven bars across the belly and sides, with intermediate half bands superiorly. Dorsal and caudal fins.

*N. CINCTICAUDA*, Blyth.

B. iii.; D. 10; P. 11; V. 8; A. 7; C. 17.

Barbels well developed, the maxillary reaching to below the front edge of the orbit. Yellowish, with 10 regular brown zones encircling the body, a dark spot at the base of the tail, and a dark band between the eye and the snout. Dorsal black-spotted.

The Irrawaddy.

### Family Clupeidæ.

Margin of the upper jaw formed mesially by the premaxillaries, laterally by the maxillaries. Barbels none. Stomach with a "cul de sac." Air-vessel simple.

*ENGRAULIS, Cuvier.*

Branchiostegals short and numerous. Body compressed, and serrated beneath. The upper jaw the longer. Maxillaries long, with a membranous attachment to the cheeks. Teeth small.

a. *Origin of dorsal fin in advance of that of the anal.*

E. BOLLAMA, Forsk.

B. xi.; D. 11-16; P. 13; V. 7; A. 29-32; C. 20.

Eyes subentaneous. Snout compressed, projecting. Teeth equal in both jaws, a small patch on the vomer, and a single band on the palate. Bluish above, silvery on the sides and belly. Head glossed with gold.

The Andamans.

Cuvier and Valenciennes remark that the flesh of this species is poisonous, if dressed without removing the head and intestines.

b. *Dorsal fin partly or entirely above the anal.*

E. TELABA, Ham. Buch.

B. xii.-xiii.; D. 1 + 14-15; P. 15; V. 7; A. 70-80; C. 19.

Eye subentaneous. Abdominal profile more prominent than the dorsal. Snout slightly overhanging. Teeth fine in the jaws, larger in the palate. Lower caudal lobe the longer; the upper truncated. Seven spinate scales behind the ventral, and 15 to 16 anterior to it. Greenish along the back, silvery below, dashed with gold. Dorsal and caudal yellow, black-stained above. Pectorals in the adult blue-black, in the young yellowish, the elongated ray uncoloured. Grows to 16 inches.

Burma, ascending the Irrawaddy as high as Mandalay.

E. INDICUS, v. Hasselt.

Zoo-roo-cart-dah. Andamans.

B. xi.-xiii.; D. 15-16; P. 15; V. 7; A. 19; C. 19.

Eye subentaneous. Dorsal and abdominal profile slightly convex, equal. Snout pointed, projecting. Teeth small in jaws, tongue and palate. Scales very deciduous. Four scutes before the base of the ventral fin. Silvery, dashed with green along the back. Sometimes dark-spotted behind the occiput. A brilliant silvery side band.

The Andamans and coast, ascending tidal rivers.

COILIA, Gray.

Branchiostegals ix. to xi. Body compressed, tail pointed. Belly trenchant and serrated. Snout pointed and projecting.

B. x.; D. 1 + 14; P. 6 + 9 to 12; V. 7.; A. 77-95.

Teeth on the jaws, vomer, palatine and pterygoid bones and tongue. Golden, fins yellowish.

Burma; common in the Irrawaddy River.

CHATOESUS, Cuvier et Valenciennes.

Eyes with adipose lids. Belly serrated. Upper jaw projecting. Branchiostegals four to six. Jaws edentulous. Air-vessel large, rounded in front, pointed behind.

C. CHACUNDA, Ham. Buch.

Kore paig-dah. Andamans.

B. vi.; D. 17-19; P. 15; V. 8; A. 19-20; C. 19.

Twenty-eight spines along the abdominal and thoracic edge, 16 or 17 of which are anterior to the ventral fin. Golden, shot with purple; lines formed of spots, along the rows of scales in the upper third of the body. A black shoulder spot. Grows to 8 inches.

Burma and the Andamans.

C. MODESTUS, Day.

B. vi.; D. 14-16; P. 16; V. 8; A. 27-28; C. 21.

Profile over the nape slightly concave, then a great rise to the base of the dorsal.

Abdominal profile equally convex. 17 or 18 serrations anterior to the ventral fin, and 11 to 12 posterior to it. Yellowish, shot with purple. Grows to 5½ inches.

The Bassein and Salween Rivers.

*C. MAXMINNA*, Ham. Buch.

B. vi.; D. 14-15; P. 15; V. 8; A. 22-24.

Abdominal profile usually the more convex. Snout prominent. Silvery, glossed with gold. Cheeks purplish, back tinged bluish-green. A shoulder spot usually present. Grows to 11 inches.

Burma, in estuaries and tanks.

*C. LUTEA*, *Artedi*.

Eyes with free adipose lids. Upper jaw not projecting. Belly serrated. Teeth, when present, rudimentary.

#### A. *Teeth in lower jaw.*

*C. ATRICAUDA*, Günther.

B. vi.; D. 18; P. 17; V. 8; A. 17-19; C. 20.

Lower jaw projects beyond the upper. A few mandibular teeth in front, a band on the tongue, and some deciduous ones on the palatines and pterygoids, but none on the vomer. Deep steel-blue along the upper third of the body, separated from the silvery sides and belly by a yellowish line. Sides and belly glossed with blue and purple. Caudal black-tipped.

The Andamans.

*C. KLEINII*, Bleeker.

B. vi.; D. 17-18; P. 16; V. 8; A. 17-18; C. 20.

Lower jaw prominent. Teeth as in *C. atricauda*. Last two anal rays thickened, and slightly elongated. Scales in regular rows, with the edges crenulated. Thirty badly-developed scutes, of which about 13 are behind the ventral fin. Silvery white, bluish above, shot with purple, below.

The Andamans and Nicobars.

*C. LONGIPES*, Cuv. et Val.

The 'oil sardine.'

B. vi.; D. 16-17; P. 17; V. 9; A. 14-16; C. 17.

Lower jaw slightly projecting. Fine teeth on the tongue, very deciduous on the palatines, and rarely on the pterygoids, none on the vomer, and minute or absent in the mandible. Scales indistinctly crenulated. About 18 badly-developed scutes before the ventral fin, and 13 or 14 behind it. Bluish along the back, with golden reflexions. Belly silvery, shot with purple, and sometimes a golden lateral line. A large greenish spot on the upper margin of opercle and preopercle. Dorsal greenish, caudal stained with green. The other fins transparent.

The Andamans.

A large quantity of oil is made from this species in Malabar.

#### B. *No teeth in jaws.*

*C. LILE*, Cuv. et Val.

B. vi.; D. 14-15; P. 13; V. 8; A. 17-20; C. 21.

Snout obtuse, lower jaw slightly projecting. Teeth on tongue and pterygoids, but none on palatines or vomer. Edges of scales smooth. Scutes 11 to 12 posterior to the ventral and 16 to 18 anterior to it. Golden, shot with purple. A brilliant silvery band one scale broad along the side. Caudal dark-tipped, shot with blue. A brilliant bronze spot on the occiput. Grows to 4 inches.

Burma.

*C. No teeth inside mouth.**C. VARIEGATA*, Day.

B. vi.; D. 15-18; P. 17; V. 8; A. 21-29; C. 17.

Jaws equal. Ten serrated scales on either side of the ventral fin. Silvery, glossed with gold and bronze. A dark shoulder spot. Back barred with 18 bands. Dorsal fin black-banded posteriorly. Tail black-tipped. Grows to 7 inches.

The Irrawaddy and its branches.

*C. ILISHA*, Ham. Buch.

Ngā-tha-louk. Burma. "Sable fish" or "Hilsa" of Europeans.

B. vi.; D. 18-19; P. 15; V. 9; A. 19-22; C. 19.

Jaws equal. Caudal deeply forked. 16 to 17 scutes before, and 11 to 15 behind the ventral fin. Silvery, shot with gold and purple. In the young a row of spots along the upper third of the body. The young are bronzed along the back, and the caudal fin black-edged. The 'hilsa' ascends rivers to spawn, and when taken full of roe is excellent eating, though somewhat rich and heavy to digest. After spawning they become thin, and, according to Day, "positively unwholesome."

*PELLONA*, *Cuvier et Valenciennes*.

Branchiostegals 6. Body compressed. Belly serrated. Upper jaw generally shorter than the lower. Fine sharp teeth on the jaws, palatine and pterygoid bones and tongue, but none on vomer. Dorsal fin small, median.

*P. SLADENI*, Day.

B. vi.; D. 13; P. 11; V. 7; A. 44; C. 21.

Ridges on the occiput diverge slightly posteriorly. 23 spinate scales anterior to the ventral, and 10 posterior to that fin. Silvery. Opercles golden. Caudal black-edged. The Irrawaddy River at Mandalay.

*DUSSUMIERIA*, *Cuvier et Valenciennes*.

Branchiostegals numerous. Belly rounded, not serrated. Snout pointed. Eyes with broad adipose lids. Small fixed teeth in the jaws, and villiform ones on the palatines, pterygoids and tongue, but none on the vomer.

*D. ACUTA*, Cuv. et Val.

O-pul-dah. Andamans.

B. XIV.XV.; D. 19-20; P. 14; V. 8; A. 14-17; C. 21.

Abdominal profile more convex than the dorsal. Scales very deciduous. Green, shot with blue. Upper margin of opercle and back light blue, with a bronzed line below, and below that again a silvery line, shot with pink. Caudal shot with blue, green and gold. Top of head emerald green. Pectoral, ventral, and anal fins white. Dorsal yellowish green. Eyes white. This fish grows to 7 inches, and is called a 'sardine,' and highly esteemed for food.

The Andamans.

*MEGALOPS*, *Commerson*.

Branchiostegals numerous. Lower jaws prominent. A narrow bony plate adherent to the mandibular symphysis, and covering the space between the rami.

*M. CYPRINOIDES*, Brouss.

Ngā-tan-yonet.

B. xxiv.xxxvi.; D. 19-21; P. 15-16; V. 10; A. 24-27; C. 19.

Eyes with narrow adipose lids. Villiform teeth in both jaws, and on the vomer, palatines, pterygoid and sphenoid. Caudal deeply lobed. Top of head dark olive, back bluish-green (paler in the immature). Belly silvery, with bluish reflexions. Scales silver-margined. Sides of head and lateral line silvery. The centre of the jaws black. Dorsal and caudal greyish, minutely black-dotted.

Pectoral, ventral and anal fins diaphanous, with some black dots. Eyes silvery, with dark orbital margins. Pupils oval.

Burma, in rivers and tanks.

*Family Notopteridæ.*

Body elongated, tail prolonged and tapering. A parieto-mastoid cavity on either side of the head, connected with the interior of the skull. Barbels none. Scales small. Abdominal edge serrated anteriorly to the ventral fins.

*NOTOPTERUS, Lacépède.*

Snout obtuse, convex. Teeth on jaws, vomer, palatines, sphenoid and tongue. Ventrals rudimentary. Air-vessel divided internally, with two horns anteriorly in connexion with the auditory organs. Posteriorly it ends in two branches, separated by the hæmal spines.

*N. KAPIRAT, Lacép.*

Ngā-hpeh.

B. viii.; D. 7-8; P. 17; V. 5-6; A. 100-110; C. 19.

Dorsal profile not so convex as that of the belly. Preorbital serrated, lower edge of preopercle with a double serrated margin. An external row of strongly curved teeth in either jaw, with an internal row of finer ones. About 28 serrations between the throat and the ventral. Silvery, darker above. Head yellow-glossed. Body with numerous fine greyish spots. Eyes golden. Grows to 2 feet.

Burma in fresh and brackish waters.

*N. CHITALA, Ham. Buch.*

B. viii.-ix.; D. 9-10; P. 16; V. 6; A. 110-125; C. 12-14.

Upper profile of head deeply concave, back arched. Snout prominent. Pre-orbital entire. Lower edge of preopercle very finely serrated. Villiform teeth in both jaws, with an outer enlarged row most developed in centre of upper jaw. About 51 serrations between the throat and the ventral fin. Coppery brown above, with 15 transverse silvery bars confluent over the back. Sides silvery. Fins with greyish spots, which are stellate on the caudal and in a row or two along the anal. Grows to 4 feet, and is rich and well-flavoured according to Ham. Buchanan.

Burma in fresh water.

*Family Symbranchidæ.*

Gill openings confluent into a single slit, situated on the abdominal surface. Body elongated. Vertical fins rudimentary, and no paired ones. Air-vessel none.

*AMPHIENORUS, Muller.*

Branchiostegals 6. A respiratory air sac, behind the head, communicating with the gill chamber. Palatine teeth in a single well-developed row. Scales present.

*A. CUCHA, Ham. Buch.*

Ngā-shin-ni.

Greenish or chestnut brown, paler below. Grows to 2 feet.

Burma, in fresh and brackish water.

Taylor thus describes the respiratory system:

"The principal organs of respiration are two small bladders, which the animal has the power of filling with air, immediately derived from the atmosphere. They are placed behind the head, one on each side of the neck, above the superior, or vertebral extremities of the branchial arches, and are covered over by the common integument, presenting externally, when distended with air, two protuberances of a round shape . . . They present when separated from their surrounding attachments and inflated with air, thin transparent membranous parietes, resembling the posterior portions of the lungs of a serpent." (Gleanings in Science, II. p. 173.)

MONOPTERES, *Lacépède*.

Branchiostegals 5 or 6. No accessory respiratory sac. No scales.

M. JAVANENSIS, *Lacép.*

Tail narrow, tapering to a point. Teeth conical and in a band, tapering towards the angle of the mouth, with a similar band on the palate. Greenish, sometimes spotted, or else the body nearly black. This species is esteemed for food.

Burma, in fresh and brackish water.

### Family *Murænidae*.

Body elongated. The humeral arch not attached to the skull.

*A. Branchial openings in the pharynx, wide slits.*

ANGUILLA, *Cuvier*.

Upper jaw not projecting. Tongue free. Teeth small and in bands. Dorsal fin commences at some distance behind the nape. Scales small, imbedded.

A. BENGALENSIS, Gray and Hardw.

B. xii.; D. 250-305; P. 18; A. 220-250; C. 10-12.

Lower jaw prominent. Lips well developed. The mandibular teeth divided by a longitudinal groove. Brownish above, yellowish below. Sometimes the upper surface is covered with black spots and blotches. Anal with a dark marginal band and a light outer edging. Grows to over 4 feet.

Burma and the Andamans, where it is common.

Buchanan remarks: "It is an irritable creature, swelling its head whenever angered, and constantly, when it can, buries itself in putrescent carcases."

A. BICOLOR, *MacClelland*.

Jee-tah-dah. Andamans.

B. xii.; D. 220-245; P. 18; A. 200-220; C. 10-12.

Jaws nearly equal. Lips thick. Dark olive above, yellowish below.

The Andamans.

MURÆNESOX, *MacClelland*.

Gill openings wide, approximating to the belly. The upper jaw the longer. Two pair of nostrils, the posterior of which are opposite the upper part or centre of the orbit. Teeth fine, with some canines anteriorly. Scales none.

M. CINEREUS, *Forsk.*

*Conger bagio*, *Ham. Buch.*

B. xx-xxii.; P. 14-16; D. 230-270; A. 190-220; C. 10.

Vomerine teeth large, with a basal lobe. The external mandibular row of teeth not directed outwards. Silvery. Beneath white. Fins yellowish, black-edged.

M. TELABOX, *Cuv.*

B. xvii-xix.; P. 15-16; D. 270-285; A. 195-210; C. 10.

Vomerine teeth large, without a basal lobe. Mandibular teeth smaller than the vomerine, and none directed outwards. Back and head olive, brown posteriorly. Belly white, silvery below. Grows to 10 feet.

The Burmese name, says Mason, signifies "*the fish that comes on board the ship*," as they are occasionally washed upon the deck.

MURÆNICHTHYS, *Bleeker*.

Eyes small. Nostrils on the edge of the upper jaw. Tongue not free. No scales.



M. SCHLIZEL, Bleeker.

Upper jaw somewhat the longer. Teeth in jaws, in three rows, pointed, the inner the larger. Palatine teeth in two rows, obtuse. Brownish above, yellowish green below.

The Andamans.

OENCHIRYS, *Ahl.*

Snout produced. Teeth in jaws and on vomer. Nostrils labial. Tongue not free. No scales.

O. COLUBRINUS, Bodd.

Eyes rather small, behind the gape. Snout pointed. Teeth in two rows, obtuse. 25 to 35 brown rings encircle the body, sometimes with a spot in the interspace between each ring.

The Andamans.

B. *Branchial openings in the pharynx, narrow slits.*

MURENA, *Artedi.*

Body elongated. Gill openings narrow. A tubular nostril on either side of the upper surface of the snout. The posterior nostril with or without a tube, and between or in front of the eyes. Pectoral fin absent.

a. *Teeth pointed. The posterior nostrils not tubular.*

M. RUFFELLII, MacClelland.

Teeth in a single row. 20 to 23 in either ramus of mandible. Canines moderate. Yellowish, with 18 to 20 black rings round the head and body, narrower than the interspaces. The mouth can be completely closed.

The Andamans.

M. RETICULARIS, Bloch.

Teeth in a single row, some slightly serrated. About 13 in either mandibular ramus. Canines small. The mouth can be completely closed. Head and back spotted, and dotted with brown; about 16 cross bands on the body, wider than the interspaces, and most distinct below, and on the tail.

The Andamans.

M. UNDULATA, Lacép.

Teeth in a single row, occasionally two inner ones on the maxilla. Four pairs of canines in the mandible, and 18 or 20 in either ramus. Two canines in the maxilla. Light brownish, with irregular-sized blotches, and light reticulated lines over the body, most distinct behind. No black gill spot. No white edge to fins.

The Andamans.

b. *Teeth in jaws pointed; on the vomer, globular.*

M. THYRSOIDEA, Richards.

Teeth conical and in two rows on the maxilla, and 23 on either mandibular ramus. No large canines. The mouth cannot be completely closed. Light brown, covered with closely-set purplish spots, with reticulated light lines. No white edge to fins.

The Andamans.

c. *Teeth obtuse.*

M. NIGRA.

Teeth in two rows on the maxilla (the inner pointed), and in three rows of 20 in each ramus of the mandible. Uniform black.

The Andamans.

*d. Teeth obtuse or molariform.*

*M. ZEEBA*, Shaw.

Teeth consist of bands of obtuse molars. A rich dark brown, with from 30 to 100 narrow white or yellow rings, sometimes incomplete.

The Andamans.

*GYMNOMURENA*, Lacépède.

Two pair of nostrils on the upper surface of the snout. Teeth small, pointed, and numerous. Fins none, save a rudimentary one round the end of the tail. Scales none.

*G. MARMORATA*, Lacép.

Anterior nasal tubes short, the posterior nostrils with a raised edge. Teeth in a band in either jaw, the inner row the larger. On the vomer, in a single row, the anterior two enlarged and acicular. Brownish grey, marbled with arborescent dark lines. Sometimes the fins are yellow.

The Andamans.

*G. TIGRINA*, Lesson.

No distinct canines. The anterior teeth in two rows. Brownish, with many irregular black spots and blotches. Grows to 4 feet.

The Andamans.

The above are but a few of the 'eels' and 'congers' found in the Indian seas and undoubtedly ranging to Burma, as no fewer than 39 are enumerated in Day's work. There is some prejudice against them as food, else they would be of importance, as some of them attain to 10 or 12 feet in length, and are well adapted for salting, when the removal of fiscal obstructions shall have rendered the preparation of salt fish a possibility with the Indian fisherman, and the poorer classes thereby placed everywhere in possession of a hitherto unattainable article of diet. What is required on grounds of public welfare is not any farther lowering of the price of salt in general, or such a concession to fishermen alone as will both tempt and permit them to 'salt' their surplus stock.

### Order LOPHOBRANCHII.

Fishes having a dermal segmented skeleton, with the opercular bones reduced to a single plate. Gills rounded tufts attached to the branchial arches. Snout produced. Mouth terminal and small. Teeth none.

#### *Family Syngnathidæ.*

Gill openings small, round, and situated at the postero superior angle of the gill cover. A single dorsal fin.

#### *A. Tail not prehensile.*

*a. Humeral bones united. Male with egg-pouch on the tail. A caudal fin.*

*SYNGNATHUS*, *Artedi*.

Body ridged. Dorsal and caudal edges not continuous. Eggs carried and hatched by the male, and covered by cutaneous folds. The eyes are capable of independent motion, as in *Chamaeleo*, producing a most grotesque appearance.

*S. SPIRIFER*, Rüpp.

Ea-dee-dah, or Lek-atha-dah. Andamans. "Turtle's tail."

A bony ridge crosses the opercle. A ridge from the snout to the nape. Ventral edge very prominent. The dorsal is situated on the first 5 rings of the tail. Anal rays minute. Divisions between the rings little apparent. Light brownish,

a brown streak from the orbit to the gape, and a second over the opercle. A few black spots below the mandible. Body brown, barred below. Dorsal barred. Caudal blackish. Grows to 5 inches, and enters tidal rivers and fresh-water.

The Andamans.

The 'Pipe fishes' are curious creatures, and may be kept in an aquarium. Major Holland describes a British species *S. ophidiom* as being, whilst under his observation over three months, "particularly remarkable for perpetually getting himself swallowed by the larger anemones. Whether his skin was too tough, or he didn't agree with them, we cannot say; but they invariably rejected him after a few minutes, and at last they ceased to pull him in, when his tail, which hung dangling down, dragged across their tentacles." (Science Gossip, September, 1870.)

### B. Tail prehensile.

*ACENTRONURA*, Kaup.

Body compressed, covered with non-tubercular shields. Occiput compressed into a crest, without a coronet. Ova carried by the males in a sac situated below the tail, and opening near the vent.

*A. GRACILLIMA*, Tonn. et Schl.

The dorsal fin stands on four rings, two of which belong to the tail. Brown, white-dotted, and with little brown markings. A band of dark spots along the dorsal. The male is darker, and of a bluish colour, with a milk-white spot on each body ring. 3 inches long.

The Andamans, where dredged in 35 to 40 fathoms.

*HIPOCAMPUS*, Leach.

Trunk compressed, with 10 to 12 rings, tubercular or spinate. Occiput coronetted posteriorly. Egg-sac as in *Acentronura*. Tail longer than the trunk.

*H. TRIMACULATUS*, Leach.

D. 19-20; P. 17; A. 4. Osseous rings 11+36.

Pale yellow ochre. Two rows of blackish spots along the dorsal fin. Sometimes a brown blotch on the first, fourth and seventh rings. Sometimes the body is black-dotted, in others banded.

Andamans. Tenasserim.

*H. NYSTRIX*, Kaup.

D. 17-18; P. 16. Osseous rings 11+36-37.

Coronet high, with 5 spines and a tubercle anteriorly, with another spine in front. Two spines below the orbit, and one behind it. All the tubercles (save the last caudal ones) in the form of slender black-tipped spines. Grey or yellowish white with brown, and white dots. 6 or 7 light patches on the tail, dark-spotted, and a few similar spots on the body. Snout with a light ring.

The Andamans, where dredged by Mr. Wood-Mason in 35 to 40 fathoms.

## Order PLECTOGNATHI.

Teleostean fishes with an incompletely ossified skeleton, and a few vertebrae.

### Family Sclerodermi.

Body compressed or angular. Distinct teeth in the jaws. Skin rough or spinate or mailed.

*TRIACANTHUS*, Cuvier.

Body oblong, compressed. Teeth in two rows in both jaws, the outer incisor-like, the inner more molariform. First dorsal consisting of a long and strong spine, followed by smaller and weaker ones. Ventrals formed by a pair of strong spines. Scales minute and rough.

T. BREVIROSTRIS, Temm. and Schl.

Ko-tah-thoo-lay-po-dah. Andamans.

B. vi.; D. 5; 22-25; P. 14; V. 1; A. 16-20; C. 12.

Upper outer row of 8 compressed teeth, the inner row of 6, rounded. The mandibular outer row of 10, in the inner, 2, similar to, but smaller than the maxillary teeth. Silvery, with a black spot on the first dorsal fin.

The Andamans.

BALISTES, *Artedi*.

Two rows of teeth in the maxilla, 8 in the outer, 6 in the inner row. A single row of 8 similar teeth in the mandible. First dorsal consists of a strong spine, followed by two weak ones. Ventrals absent, or represented by a ventral process.

The flesh of these fishes is a virulent poison, causing gastric spasms and tetanic paroxysms, which end fatally. An immediate emetic, followed by oil and demulcents to allay irritation, is the appropriate treatment.

B. VIRIDESCENS, Bloch. Schn.

D. vi.; D.  $\frac{3}{24}$   $\frac{3}{24}$ ; P. 14; A. 23-24; C. 12.

A groove in front of the eye. Teeth white, compressed, notched. Four and a half rows of recurved spines on the side of the tail. A light ring round the muzzle, joining one from below, and separating the black lip from a black band on the forehead. Body brownish olive, each scale darkest in the centre. A blackish band from the eye to the tail. Vertical fin yellowish, with dark margins and sinuous lines. Blue blotches on the first dorsal.

The Andamans.

B. FLAVOMARGINATUS, Rüpp.

B. vi.; D.  $\frac{3}{26}$   $\frac{3}{27}$ ; P. 15; A. 23-24; C. 14.

A groove in front of the eye. Four to six rows of rather small recurved spines on the side of the tail. Bluish-olive, paler and buffish below. Chin and chest orange, fading to yellow. Vertical fins with a dark base, and band above it. Grows to 20 inches, the adults being of a uniform colour.

The Andamans.

B. UNDULATUS, Lacép.

B. vi.; D.  $\frac{3}{26}$   $\frac{3}{26}$ ; P. 14; A. 22; C. 12.

No groove in front of the eye. Four to six strong spines on either side of the tail. Brownish, with numerous undulating yellow lines from the eye and back, to the anal and caudal fins, and three or four from the lips. A dark band along the base of the dorsal and anal fins.

The Andamans.

MONACANTHUS, *Cuvier*.

Two rows of incisor-like teeth in the maxilla, six in the outer row, and a row of six similar ones in the mandible. The first dorsal consists of a single spine. Ventral as in *Balistes*.

M. MONOCEROS, L.

B. vi.; D.  $\frac{3}{46}$   $\frac{3}{48}$ ; P. 14; A. 48-53; C. 12.

Dorsal spine rough, but without barbs. Brownish or blackish. Fins yellow.

The Andamans.

### Family Gymnodontidæ.

Jaws armed with a cutting edge, or osseous beak. Fins spineless. Ventrals absent. Skin spinate.

Many of the species of this family are in the habit of inflating their bodies with air when caught, till they swell themselves out into tight little balls, uttering the

while a grating sound, whence the imitative name of one species in India (*Catantia*). When thrown again into the water, the fish is unable to sink in spite of its efforts, till it has discharged the air with which its body is distended. Some species are considered to be highly poisonous, whilst others are eaten, but only by the poorest classes. The Burmese call them Ngā-bū-dyn, and they are not only a nuisance to the fisherman, from delighting to bite his line asunder, but torment the bather, if stationary for a moment, by nipping a piece out of his flesh with their parrot-like beaks.

*XENOPHILUS*, *Duméril*.

Nostrils funnel-shaped, with fringed margins. Jaws divided by a median suture. Dorsal and anal fins with many rays.

*X. NARITUS*, Richardson.

Ngā-bu-dyn.

B. v.; D. 32-38; P. 19; A. 28-32; C. 12.

Eyes small. Lips thick and fringed. Spines with 2 or 3 roots present between the eye and the pectoral fin, also below that fin, and backwards along the belly, nearly as far as the vent. Pale yellow, darker along the back.

Burma, in rivers and estuaries.

*TERRIDOX*, *Linnaeus*.

Jaws divided with a median suture. Dorsal and anal fins with few rays.

*T. LUNARIS*, Bloch, Schn.

Cha-mo-dah. Andamans.

B. v.; D. 12-14; P. 16-19; A. 11-12; C. 10.

Eye large. Back and belly covered with small spines. Snout, sides and tail spineless. Greenish olive above, sides and belly white, with a yellow line from the eye to the tail. Grows to a foot.

The Andamans, where it is eaten.

*T. RETICULARIS*, Bloch, Schn.

Ko-pud-dah. Andamans.

D. 10-11; P. 19; A. 10-11; C. 10-11.

Upper surface of the body deep grey or brown, white below, with from 8 to 10 longitudinal black stripes, anterior to the anal and pectoral fins. Body posteriorly spotted. Grows to 17 inches, and is deemed very poisonous.

The Andamans.

*DRODOK*, *Curier*.

Body nearly globular. Jaws without median suture. Body covered with stiff erectile dorsal spines.

*D. HYSTRIX*, L.

The whole body, except the belly, of a light brown, covered with round blue or brown spots. Fins spotted like the body. Grows to 2½ feet.

The Andamans.

### Sub-class *CHONDROPTERYGII*.

Skeleton cartilaginous. Caudal with an elongated upper lobe. Intestines with a spiral valve. Males furnished with prehensile organs. Ova large. Some species viviparous. Embryo with external deciduous gills. No air-vessel.

### Order *PLAGIOSTOMATA*.

Five to seven gill openings. Jaws distinct from the skull.

a. *Gill openings lateral.*Family **Carchariidæ.**

A nictitating membrane to the eye. Mouth crescentic, inferior.

**CHARCHARIUS**, *Müller and Henle*

No spiracles. A pit before the root of the tail. Snout produced. Teeth with a sharp compressed cusp.

a. *Teeth with smooth edges and without swollen bases.*

**C. LATICAUDUS**, Müll. and Henle.

The groove at the gape scarcely extends on to the upper jaw. Nostrils very much nearer the mouth than the end of the snout. Uniform grey above, white beneath. Pectoral deep-grey, white-edged, as are the ventral and anal fins. Caudal dark-tipped. Grows to 2 feet.

b. *Teeth with smooth edges, oblique, and without swollen bases.*

**C. WALBEEHMI**, Bleeker.

Ei-dah. Andamans.

A well-marked groove at the gape, extending a short distance along both jaws. From snout to mouth equals the space between the outer margins of the nostrils. Light brown above, dull white below.

The Andamans.

c. *Some or all the teeth serrated on their base and cusps.*

**C. GANGETICUS**, Müll. and Henle.

A very slight groove at the gape. Nostrils in advance of midway between the snout and the mouth. Teeth 27 to 30 in either jaw. Pectorals falciform, and reaching to the middle of the first dorsal. Colour much as in *C. laticaudus*. Grows to 7 feet, and is reputed to be one of the most ferocious of Indian sharks.

**C. MELANOPTERUS**, Quoy et Gaim.

A very short groove at the gape. Snout rounded and very obtuse. Pectoral fin falciform, its outer edge three times as long as its inner and reaching to the middle (or more) of the base of the dorsal. Second dorsal opposite and similar to the anal. Scales large, lineated, and with entire edges. Brown or bluish grey above, white below. Teeth 24 to 25 in each jaw.

The Andamans.

Dr. Day does not give the size attained by this fish, but adds that the *liver* of one captured at Calicut weighed 270lbs. According to Dr. Buist (*Proc. Zool. Soc. Lond.*, 1850, p. 100), the shark fishers at Kurachi employed 13 boats each with a crew of 12 men. The 'Mhor' or 'Great basking shark' is said to grow to from 40 to 60 feet in length and to be taken by the harpoon when asleep on the surface. When exhausted by its struggles, the fish is hauled up and despatched or stunned by blows with clubs, and is then towed on shore, several boats uniting for the purpose when an unusually large fish is captured. They are also taken in nets with 6 inch meshes, six feet wide and often nearly a mile in length. These nets are buoyed vertically, and sunk some 80 to 150 feet below the surface. The smaller sharks are usually brought up dead, and the larger ones much exhausted. On being brought on shore the fins are cut off and dried in the sun (Dr. Buist says only the back fins, but elsewhere I believe all the fins are taken), the flesh cut off in strips and salted, and the liver carefully extracted for oil. In 1845, over 229 tons of sharks' fins were imported into Bombay from various ports, and over 443 tons exported, chiefly to China, valued at £18,231.

C. TEMMINCKII, Müll. and Henle.

Nostrils nearer to the mouth than to the end of the snout. 38 erect teeth above, and 40 below. The upper rather narrow with a broad base, the lower entire and awl-shaped. The teeth near the outer angle of the jaws very small. Second dorsal opposite the anal, and as large as the first. Colour uniform.

GALEOCERDO, *Müller and Henle*.

Spiracles small. A nictitating membrane over the eye. A pit on the base of the tail, both above and below. Teeth oblique, serrated on either edge, and with a deep outer notch.

G. TIGRINUS, Müll. and Henle.

A labial fold along the edge of the upper jaw. Grey, paler beneath. Numerous dark grey or brown spots on the body.

ZYGENA, *Curier*.

The anterior portion of the head flattened, and laterally elongated, with the eyes at the lateral extremities, and the nostrils at its fore-border. Eyes with a nictitating membrane. Spiracles none.

Z. BLOCHII, Cuv.

The lateral expansion of the head twice or thrice as long as broad, with a deep groove along the fore edge. Nostril nearer the mouth than the eye. Deep grey, paler beneath. Fins darker. Grows to 4 feet or more.

The "hammer-headed" sharks are much dreaded, and are common in the Bay of Bengal.

### Family Scyllidæ.

Spiracles present. Eye without a nictitating membrane.

STEGOSTOMA, *Müller and Henle*.

Spiracles about the size of the small eye, behind which they are situated. Nasal and buccal cavities confluent. Snout obtuse. Upper lip thick, with a cirrus on either side. A well-developed labial fold at the gape. Teeth small, sometimes trilobed, the dental plate being almost quadrangular. Caudal fin very elongate.

S. TIGRINUM, Gmel.

Colour of young black, with white or buff bands on the head and body, with spots between. The adults are tawny, with bands of rounded spots.

This is one of the species Mason says is common on the coast, and whose fins are collected for export to China.

It seems by no means improbable that Homer, in describing Scylla, may have had in view the jaws of some species of this family, perhaps the dried trophy of some stranded monster of the deep; and borrowed the idea of Scylla's twelve limbs from some mariner's yarn he may have heard of an octopus—

τῆς ἥτοι πόδες εἰσὶ δυνώδεκα πάντες ἄωροι,  
ἐξ δὲ τέ οἱ δειραὶ περιμήκεες, ἐν δὲ ἐκάστη  
σμερδαλέη κεφαλὴ, ἐν δὲ τρίστοιχοι δόνοντες  
πυκνοὶ καὶ θαμέες, πλείοι μελανοὶ θανάτοιο.—*Odyssey* XII. 89.

Twelve feet deformed and foul, the fiend dispreads,  
Six horrid necks she rears and six terrific heads;  
Her jaws grin dreadful with three rows of teeth,  
Jaggy they stand, the gaping den of death.—*Pope*.

*b. Gill openings ventral.***Family Pristidæ.**

Snout produced and flattened into a 'saw,' with numerous so-called teeth along its edge.

*PRISTIS, Latham.*

Spiracle wide and behind the eye, which is devoid of a nictitating membrane. Nostrils inferior. Teeth (true) minute and obtuse.

Three species inhabit the Eastern seas: *P. cuspidatus*, with distinct lower caudal lobe, and 25 to 35 pairs of rostral 'teeth,' but none for the basal fourth of the snout; *P. Perrotteti*, with no distinct lower caudal lobe, and 17 to 20 pairs of rostral 'teeth' from its base, and the dorsal in advance of the ventrals; and *P. zysron*, which resembles the last, but has 25 to 32 pairs of rostral 'teeth,' and the dorsal fin posterior to the ventrals.

These fish are valuable for their fins, which, together with those of sharks, are dried and exported to China, and for the oil which is extracted from the liver. They attain a great size, a specimen of *P. zysron* caught on the coast of Sind measured over 16 feet, and a *P. cuspidatus*, captured at Calicut, afforded a liver which weighed 185 pounds. They ascend rivers far above tidal influence, and are eaten by low-caste natives only.

**Family Rhinobatidæ.**

Pectoral fins not continued to the snout. Trunk gradually passing into the tail. Two dorsal fins.

*RHINOBATUS, Bloch. and Schneider.*

Body depressed and elongated. Spiracles wide and behind the eyes. Snout elongated and connected by a membrane with the pectoral fin. Nostrils oblique and wide. Teeth obtuse ridged. No lower caudal lobe.

*R. GRANULATUS, Cuv.*

Ngā-man-huáng.

$3\frac{1}{2}$  dental plates, with a central and lateral elevation in the mandibular ones, and a corresponding depression in the maxillary. 20 to 22 vertical rows of teeth above, and 13 in the mandible, opposite the symphysis. Scales tubercular, and a spined vertebral row. Reddish-grey above, white below. Grows to 7 feet.

The Andamans.

*R. THUINI, Lacép.*

Teeth small, upwards of 100 rows in either jaw. Skin granulated with a row of compressed spines along the middle of the back, and smaller ones over the shoulders and about the eyes. Brown, yellowish-white beneath.

The Andamans.

**Family Torpedinidæ.**

Disk smooth. An electric organ situated between the pectoral fin and the head.

Mason says a 'Torpedo' is found on the coast. Day mentions two species: *Narcine timlei*, Bloch., with two dorsal fins, and which grows to 18 inches; and *Astrape dipterygia*, Bloch., with one dorsal fin, and which is somewhat smaller. A species of *Narcine* (?) is common in the Bassein River, at Ngā-pootau, if my memory serves me.

**Family Trygonidæ.**

Disk wide. Pectorals continued to the end of the snout, where they join.



*TRYGON, Adanson.*

Nasal valves coalescent, and forming a quadrangular flap. Teeth flattened, with a central point, or transverse ridge. Tail without a fin, and armed with one or two lanceolate serrated spines.

*T. SIPHÆA, Forsk.*

Upper surface of head, body, and base of tail covered by thick, flat, or concave, many-sided tubercles. Young reddish-brown. Adults lead-coloured, with terminal two-thirds of tail black.

This species Mason says is common on the coast. It grows to a large size, 6 feet or more across the body, and the wounds it can inflict with its tail are much dreaded.

### *Family Myliobatidæ.*

Body very broad from the large development of the pectoral fins. These fins are not present on the sides of the head, but reappear as a pair of detached fins at the end of the snout.

*LETOBATUS, Muller and Henle.*

Head distinct from disk. Snout with a soft prolongation, internally supported by fin rays. Teeth hexagonal, broad, flat, with the lower dental laminae projecting beyond the upper. Tail whip-like, dorsal fin present near its base, and with a serrated posterior spine.

*L. NARINARI, Cuv.*

Ra-ta-chorm-dah. Andamans.

Tail three or four times as long as the body, triangular in section, as far as the spine, and compressed behind it. Body smooth. Greyish-olive sometimes, greenish-olive, or leaden grey, covered with black-edged, dirty-white, or bluish spots. Belly white. Tail black. Iris golden-green. Teeth greenish-yellow.

The Andamans.

## HERPETOLOGY.

---

### Class AMPHIBIA.

Cold-blooded vertebrata which breath by means of gills, mostly external in the early stage of life and deciduous, afterwards by lungs. Adults finless. A metamorphosis before reaching maturity. Two occipital condyles. Oviparous. External reproductive organs none. No species are poisonous.

### Order OPHIOMORPHA.

Body worm-like, long, cylindrical and limbless. Skin smooth, with annular folds. Eyes rudimentary. The young do not pass through an aquatic career, but are provided with short gills, which soon disappear. In the adult one lung is only developed, the other remaining rudimentary as in most snakes.

#### *Family* Cæciliidæ.

*ERICIUM*, *Wagler*.

A small groove in front and below the eye near the labial margin.

*E. GLUTINOSUM*.

The labial groove incloses a short, slender, exsertile tentacle. Upper jaw projecting. The eye distinctly seen beneath the transparent skin. From 280 to 320 transverse folds on the body and tail. Colour black, with a lateral yellow band on either side. Grows to 15 inches.

Inhabits South India, Java, Siam, Tenasserim and Arakan.

*E. MONOCHROMUM*, *Bleeker*.

This species differs from the last in wanting the yellow side band, and has been obtained in Singapore and may be found to range into Burma.

### Order URODELA.

Tailed amphibia, with lizard-like bodies, and tails well developed. Feet two or four. Gills permanent or deciduous.

#### *Family* Salamandridæ.

*TYLOTriton*, *Anderson*.

Teeth in both jaws. Skull surrounded in both sexes by a prominent porous ridge. Paratoids large, auricular, flattened. A lateral line of porous glandular knobs. A broad porous vertebral ridge. A permanent gular fold from paratoid to paratoid. Tail long. Limbs well developed. Skin tubercular. Toes unwebbed, 4 to 5.

*T. verrucosus*, Anderson.

Sixteen glandular knobs along the side, the first behind and above the axilla, the last three behind the articulation of the femur. Colour blackish-brown, paler on the chin, throat, and under surface of limbs, all of which have a brownish-olive tinge. Under surface of the tail orange-yellow.

Males, body 4.00; tail 3.75=7.75 inches.

Females, body 3.00; tail 3.00=6.00 inches.

Common in the high country of Yunnan, and extending into Sikkim.

The vertebrae of the trunk are opisthocœlian, but the sixteenth and all posterior caudal vertebrae are proœlian.

This remarkable species having been discovered in Sikkim, by Col. G. B. Mainwaring, may possibly be detected in the damp forests of Arakan, which are quite as suitable to it as Sikkim.

### Order BATRACHIA.<sup>1</sup>

Tailless amphibia breathing by lungs in the adult stage. Legs well developed. Vertebrae proœlious. Oviparous. Respiration, owing to the rudimentary character of the ribs, is an act of swallowing.

#### Family *Ranidæ*.

##### *a. Water frogs.*

*OXYGLOSSUS*, *Tschudi*.

Fingers free. Toes webbed. Vomerine teeth none. Tongue not notched behind.

*O. LEVIS*, Günth.

Tympanum indistinct, smaller than the eye. Skin with a few scattered tubercles. Colour pale vinaceous, lighter on the limbs, and finely marbled. Below yellowish-white, marbled with dusky on the throat. A distinct tarsal fold, and a very thin one on the fifth toe.

Length, a little over an inch. Maulmain, where it ranges from the Philippines.

*O. LIMA*, Tsch.

Tympanum quite indistinct. Body above covered with small subequal tubercles, of which two rows on the chin and throat are conspicuous for their regularity. Colour greenish-brown, with a pale dorsal streak. Femur dark-banded. Below yellowish-white, with two brown bands from the middle of lower lip to the belly.

Grows to a little more than an inch.

Maulmain, in company with the last in swampy grounds.

For full descriptions, see Stoliczka, J.A.S.B. 1870, p. 273.

*RANA*, *Wagler*.

Fingers free. Toes webbed. Maxillary and vomerine teeth.

*R. KÜHLII*, Dum. et. Bib.

Hpā (generic).

Tympanum hidden. Skin in adults smooth above and below, but in the young slightly tubercular on the sides. Colour greenish-brown, with a rufous tinge, marbled with darker, which marks become faint in large individuals. Sometimes a yellow dorsal line. The lower jaw has two large fang-like apophyses. Usual size 2 inches, but grows to double that size. Ranges from Yunnan to Tenasserim, Ceylon, China, Java and Borneo.

<sup>1</sup> As these pages were going through the press, the British Museum Catalogue of Batrachia Salientia, by Mr. Boulenger, came into my hands. I have been able to add little, therefore, from it here, but have given Mr. Boulenger's arrangement of the Burmese species in the Appendix.

*R. tigrina*, Daud.

Tympanum moderate, as large as the eye. Skin on the back with numerous short longitudinal folds. Above brown, with large blackish spots, and with or without a pale vertebral line. Lips whitish, black-spotted. Colour varies rather from admixture of greenish or yellowish. Mandibular apophyses distinct. Grows to 7 inches. Ranges over India and Burma.

Anderson describes the males during the breeding season as pale greenish-yellow, with dark spots, and a pale vertebral streak; and the larger females as greyish-olive, with dark spots. This is the common 'Bull frog' of the Europeans in India, and has a powerful voice; though when the animal is concealed, it is often difficult to make out where the voice emanates from, by the sound.

*R. cyanophlegetis*, Schn.

Tympanum rather indistinct, as large as the eye. Mandible with two distinct but not prominent apophyses in front. No fold of skin across the occiput. Skin of the back finely tubercular or nearly smooth. Metatarsus with a single pointed tubercle. Vocal sacs large. Upper parts dark brownish-olive, with irregular brown spots. No pale vertebral streak. Below white. A white band behind the thighs from ham to ham. Grows to 2 to 5 inches.

Inhabits Pegu, the Malayan Peninsula and Bengal.

*R. gracilis*, Wieg.

Var. *Andamanensis* and *Nicobarensis*.

Tympanum moderate, smaller than the eye. The skin of the back with short longitudinal folds. Greyish-olive, dark-spotted, and limbs dark-barred. A pale vertebral line generally present. Mandibular apophyses inconspicuous. This is a small species. Stoliczka's largest Akyab specimen being 2.5 inches.

See Stoliczka, in J.A.S.B. 1870, p. 12.

Inhabits Burma, the Andamans, Nicobars, Siam and Hongkong.

*R. fusca*, Blyth.

Tympanum indistinct or hidden. Two fang-like apophyses on the mandible. Skin subgranulose above, smooth below. A pale vertebral streak sometimes present. Colour dark olive-grey above, white below; upper lip black, as also the fold from the eye over the tympanum. Limbs barred, and posterior surface of the thigh marbled. No vocal sacs. Length of head and body (nearly) 6.5, of hind limb 9 inches.

This species appears to be closely allied to *R. tigrina* in its vomerine ridges, and in the general form of its body; but approaches *R. kuhlii* in its fang-like apophyses, almost hidden tympanum and metatarsal tubercle.

Inhabits Tenasserim. See Blyth, J.A.S.B. 1855, p. 719, and Anderson, P.Z.S.L. 1871, p. 198.

*R. yunnanensis*, Anderson.

A glandular fold from the eye to the shoulder over the tympanum. A feeble fold along the metatarsus, and along the first toe, inclosing a small sharp-edged crescentic tubercle. A fold along the fifth toe. Upper surface densely covered with round warty tubercles, each surmounted by a black horny granule. Greenish olive-brown, with dark bands on the upper surface of the limbs. Beneath smooth, and brownish-yellow, reticulately spotted with brown. Length 2 inches. Habitat Hotha at 5,000.

*LYMNODYTES*, *Dumeril et Bibron*.

Skin smooth, with a glandular fold along each side of the back, and usually a second below the former. Fingers free. Toes webbed. Disks not much developed.

(*Lymanodytes* is preferable to *Hylarana* as less misleading, as it is an essentially water frog, and its dilated extremities do not (as has been supposed) indicate an arboreal or semiarboreal life.)

*L. tytleri*, Theobald.

Adult olive-green above, blackish on the sides anteriorly, and mottled with black posteriorly. The glandular folds are white. Below pale, mottled with black. Limbs barred with brown.

Head and body 2·0, hind limb 3·3 inches. Burma.

This is the representative in Bengal and Burma of *H. erythraea*, which it closely resembles, but has, says Blyth, "shorter and stouter limbs and short anterior digits." See Stoliczka, J.A.S.B. 1870, p. 148.

*L. SIGROVITATUS*, Blyth.

Colour "above ruddy plumbeous, below albescent with a broad blackish band from the nostril to the base of the hind limbs," with a slightly palish upper margin in place of the broad white stripe of *L. erythraeus*. Limbs posteriorly dark-marbled.

Head and body 2·0, hind limb 3·15 inches. Inhabits Tenasserim.

*L. NICOBARIENSIS*, Stoliczka.

Much like the last, but tympanum larger ("a little smaller than the eye"), and the disks more developed. Colour greenish-olive, almost black in some males. Sides and loreal region black. Below black-mottled; yellowish between the thighs.

Head and body of male 2·0, hind limb 3·25 inches. Inhabits the Nicobars.

*L. GRANTIOSA*, Anderson.

Tympanum nearly as large as the eye. Two glands behind the mouth, but not prolonged along the side. Two well-developed metatarsal tubercles. Back granular, with a few scattered tubercles in the sacral region. Colour above olive-brown. A dark lateral band and a narrow white streak from the eye along the glandular fold behind the gape. Throat dusky. Below yellowish, reticulately spotted with brown. Legs barred. Grows to 2·2 inches. Inhabits Assam and Pegu.

*L. MARGARIANA*, Anderson.

Body slender. Tympanum nearly as large as the eye. Vomerine teeth very fully developed on two obscure ridges, widely separated. Limbs long and slender. The web reaches the disks on the toes except on the fourth. A small elongated tubercle at the base of the first toe. Disks on the fingers feebly developed, on the toes more so. Skin smooth. A glandular lateral fold. Above dark olive-brown, with a blackish band through the eye to the groin, and a narrow pale yellowish line from the eye to the shoulder. Limbs banded. Throat and chest almost black.

#### *b. Ground frogs.*

*XENOPHRYS*, Gunther.

Fingers and toes tapering, free. Tympanum small. No paratoids. Vomerine teeth present. Upper eyelid well developed, but without appendages.

*X. MONTICOLA*, Günth.

A linear fold from the orbit over the tympanum to the axilla. Tongue large, not notched behind. A fold on the nape, with the angle pointing backwards. Colour above brownish-olive. A dark spot on the crown. A brown spot below the eye, and a brown band below the supratympanal fold. Lower parts brown-marbled. Head and body 2·75; hind leg, 4·1 inches. See Anderson, in P.Z.S.L. 1871, p. 200.

Pegu and Sikkim.

*CALOPHRYNUS*, Tschudi.

*Berdmorea*, Stoliczka. (Proc. As. Soc. Beng. 1872, p. 146.)

Habit bufonine, with proportionately short hind limbs. Head moderate, triangular. Fingers free, toes webbed; tips of both very slightly swollen, truncate; heel with two small tubercles. Skin granular. Tympanum distinct. Eustachian tubes rather large. Tongue entire. Maxillaries sharp, edentulous; intermaxillary not ossified. An interrupted fold of skin behind the choanae, and two others further on on the palate, both papillose, but the posterior much stronger than the anterior.

*C. INTERLINEATA*, Blyth.

The live animal is one of the most beautifully coloured frogs. The entire body is strongly tinged with vinaceous red, paling to golden yellowish on the lower belly. The two longitudinal dorsal bands are sometimes not very conspicuous on account of the entire upper surface being reticulated with narrow vinous brown bands; the large

round spots in front of the bases of the femora are deep purplish black, encircled with golden yellow. The sides are also purplish black near the edge of the back, but the colour shades into purplish towards the belly; lips, throat and breast rich vinaceous.

The fold across the occiput in the type specimen, re-described by Dr. Anderson, appears to be accidental, for another beautifully preserved one does not show a trace of it.

Length of body 1·8, hind limb measured from vent 2·1, fore limb 1·1 inch.

Both in the type and another specimen collected by Theobald in Pegu, the skin above is not only porose, but throughout distinctly granular. (Stol. l.c.)

Inhabits Pegu and Martaban, sheltering itself under stones, in damp forests.

*MICRONYLA*, *Tschudi*.

Head small. Teeth none in jaws or palate. Tongue entire behind. Tympanum hidden. Fingers free. Toes webbed. Tips of both more or less dilated.

*M. (ENGYSTOMA) CARNATICA*, Jerdon.

Disks small. Metatarsal tubercles two. Colour above isabelline or yellowish-brown, with a dark bottle-shaped mark from between the eyes; on the back a triangular black mark above the anus. Limbs brown-banded. A pale streak from the eye to the shoulder. Chin and throat dusky. Belly whitish. During life the sides have a faint rosy tinge, much as in *Callula pulchra*.

Head and body 1·0; anus to metatarsal tubercle 1·0 inch. Maulmain, under logs.

See Stoliczka, J.A.S.B. 1870, p. 154.

*M. (ENGYSTOMA) BERDMOREI*, Blyth.

*Callula natatrix*, Cope.

Tympanum concealed. Head small. Fore limbs small. Hind limbs very large, and toes fully webbed. Colour above dusky. Throat dusky. The rest of the lower parts white. A dark bottle-shaped mark from between the eyes.

Head and body 1·50; hind limb 2·80 inches.

Pegu, abounding in hill-streams and the adjoining forests.

It is contrary to facts for Dr. Anderson (P.Z.S.L. 1871, p. 202) to state that I identified *D. pulchrum* with this species. In my Catalogue, cited by Dr. Anderson, it is distinctly shown that there were *no specimens* of *D. pulchrum* in the Museum, and *D. Berdmorei* follows beneath *Engystoma*, though, by a typographic error, the species is printed in italics. This is the sole ground for Dr. Anderson's absurd and mischievous allegation.

*GLYPHOGLOSSUS*, *Günther*.

Tongue long, free, and notched behind and in front; divided into two lateral halves by a deep groove. Tympanum hidden. Openings of eustachian tubes small. Toes broadly webbed. Metatarsus with a large shovel-like prominence.

*G. MOLOSSUS*, Günth.

Snout very short. The lower jaw truncated in front into a fleshy semicircular disk. Body short, and thick. Limbs very short. Skin on the loins loose. Pupil vertical. Skin smooth. Colour above uniform brownish-olive, marbled with brown on the sides and limbs; below whitish.

Length 50 mill. Inhabits Eastern Pegu.

The type specimen only is known. It was taken by myself under the following circumstances:—I had halted one day within the tidal portion of the Irrawaddy Delta, to enable my boatmen to prepare their dinner. One of my servants having cooked his rice, poured out the hot-water as usual on the ground, and some of it went down a hole that happened to be near the spot. No sooner, however, had the hot-water disappeared, than out scrambled, in great haste, a fine *Glyphoglossus*, only, alas! to be transferred to a collecting jar. So true does it often prove

“Incidit in Scyllam qui vult vitare Charybdis!”

*CALLULA*, *Gray*.

Habit stout. Head and gape short. Teeth none. Tongue entire, free. Skin smooth. Tympanum hidden. Tips of fingers enlarged, of toes less so.

*C. PULCHRA*, Gray.

*Hylobactylus bittatus*, Cantor.

Eye rather small. Thigh enveloped in the skin of the side. Back and outside of limbs brownish olive, with some small black spots. Muzzle and side reddish grey, or rosy, the tint varying with season, the colour forming a side band edged with black and the two confluent across the snout. Below this reddish band a dark band concolorous with the back comes on behind the eye and hardly reaching to the loins. Chin dark. Belly marbled. Iris golden brown. Pupil transversely rhombic.

Grows to over 3 inches.

This fine species is very common in Pegu, and harbours under stones in damp spots like a toad. The enlarged finger-tips bear no relation to arboreal habits, and would seem to be merely simulative of the adhesive disk on the digits of tree frogs, and functionless unless of use in forming a bed in soft earth.

The following species has been separated by Stoliczka from *Callula*.

*CALLULLA*, *Stoliczka*.

Habit stout. Head and gape short, maxillary and vomerine teeth present, choanae and openings of eustachian tubes small, two folds across the palate, lower jaw with two prominences. Tongue entire, free behind. Fingers free, toes webbed, both with truncated, but not swollen tip. Metatarsus with an inner shovel-like prominence. Processes of sacral vertebrae dilated. Tympanum hidden. Skin smooth.

*C. GUTTULATA*, Blyth.

Eye small. Colour variable, above pinkish-olive maculately marbled with black-bordered brown spots. A transverse black mark across the vent. The reniform marbling somewhat resembles the arrangement of water drops on an oily surface.

Length over 3 inches. Inhabits Pegu.

Stoliczka adds:—"Blyth, when originally describing the species as a *Megalophrys*, must have noticed the maxillary and vomerine teeth, and was, therefore, not very wrong in his determination, but his description is so insufficient, that I would have hardly ventured to identify the present species with it, had Dr. Günther not done so. *Callulla* appears to connect *Pyricephalus* with *Megalophrys*, differing from the former by the entire tongue and from the latter by the absence of cutaneous prolongations on the eyelids. It evidently belongs to the family *Dicnoglossidae*.

"Although this species externally most closely resembles the type of the genus *Callula*, *C. pulchra*,—except in having the tips of fingers and toes scarcely swollen, instead of dilated,—it essentially differs by having two very distinctly toothed ridges extending from behind the choanae towards the centre of the vomer and also by the toothed maxillaries and intermaxillaries. An adult specimen of about the same size as the one figured by Günther shows these characters very distinctly, but in young ones these denticulations are scarcely or very deficiently traceable. I have examined a large series of *Callula pulchra*, but as none of them show any teeth on the vomer or on the maxillaries, a generic separation of the present species appears to me justified."

*LEPTOBRACHIUM*, *Tschudi*.

Vomerine teeth none. Fingers free, toes webbed at the base.

*L. HASSELTII*, *Tschudi*.

*Nircus pulcherrimus*, Theobald. British Burma Gazetteer, Vol. I. p. 638.

A few specimens of this most lovely frog were captured by me in stream beds in the Arakan hills, but all were subsequently lost. The following brief note may serve to lead to the recognition of the species. Length about an inch. Mouth very broad, bufonine. Colour light pinkish silvery-grey. Back beautifully ornamented with velvet black reniform spots. Pupil of eye lozenge-shaped, vertical; the upper half bright orange, the lower black. Legs feeble.

Inhabits the Arakan Range or Western Yo-mā. This is a remarkable habitat for such an animal, as it was only previously known from Java.

*c. Tree frogs.*Family **Polypedatidæ.**

Fingers and toes more or less dilated at their tips into pneumatically prehensile disks, in accordance with their arboreal habits.

POLYPEDATES, *Dumeril et Bibron.*

Skin smooth. A fold from the eye to the tympanum, but none along the back. Tongue elongate and deeply notched behind. Fingers partly, toes broadly webbed. Disk well developed. Habits arboreal, crepuscular. Females larger than the males.

*P. MACULATUS*, Gray.

*P. leucomystax*, Dumm. et Bib.

Eye large. Tympanum nearly as large. Skin smooth above. Disks large. Fingers slightly, toes broadly webbed. Colour variable, pale-brown or grey above. Limbs barred. Upper lip pale. A dark streak through the orbit and tympanum. Under parts dirty white.

Females grow to 3·5 inches. Males to 2·25 inches.

Ranges through India to Burma and China.

These animals are arboreal and crepuscular, and during the day remain in concealment under bushes in damp spots. As the shades of evening spread, their feeble piping note may be heard, and they may be seen if carefully looked for moving about among the branches, and not unfrequently assuming grotesque attitudes, holding on with out-stretched limbs to twigs, either arrested in these attitudes, by the approach of the observer, or on the outlook for insects. They also enter houses in pursuit of insects, and their presence is perhaps first announced by the heavy flop of their bodies falling from the walls or ceilings on the smooth surface of a table or the polished floor.

*P. YUNNANENSIS*, Anderson.

Tympanum more than half a diameter of the eye. Vomerine teeth in two oblique, convergent but separated ridges. Thumb much swollen in the male. Disks feebly developed. A few wart-like glands behind the gape and a series from the shoulder along the sides, in the position of the fold on *Hylarana*, with numerous wart-like glands below it. Belly minutely granular. A circular granular area on the chest. Above dark-greenish brown, with ragged dark-brown spots. Limbs and feet barred. Jaws spotted. Below yellow, sometimes faintly spotted. Length 2·73 inches.

Near Hothia at 4 to 500 feet.

It differs from its nearest ally *P. marmoratus*, by its smaller disks, and "more emarginate interdigital membrane."

In Boulenger's Catalogue of the Batrachia Salientia, this species is transferred to *Rana*, and renamed *R. Andersonii*, in conformity with the author's practice of disregarding the significance of the digital disks, and selecting as of more importance the absence or presence of an interdigital web. The natural genus *Polypedates* hence comes to be split up, those species with *web* between the fingers being referred to *Rhacophorus*, and those without, to *Rana*.

*P. MARMORATUS*, Blyth.

*P. Afghana*, Günther.

Tympanum very small, the size of one of the finger disks. Vomerine teeth in a straight line interrupted in the middle. Disks well developed. Skin smooth or sometimes finely granular above and more coarsely so on the sides. Above brown, very finely marbled or spotted with pale yellowish brown. Below yellowish, unspotted. Throat sometimes brown-spotted.

Ranges from Darjiling to Pegu and Yunnan.

This species, because its fingers are free, is transferred by Boulenger to *Rana*, in spite of its well-developed digital pads. As it is next to certain that the species did not come from Afghanistan, but from the Eastern Himalayas, Blyth's name seems entitled to retention.



*P. QUADRILINEATUS*, Wieg.

Closely resembles *P. marmoratus*, but the vomerine teeth are in two distinctly oblique convergent series. Colour above brownish-olive, with four dark and black-edged bands down the back. Grows to 3 inches. Inhabits Pegu and Tenasserim.

*P. LIVIDUS*, Blyth.

Skin smooth, and only granulose on the posterior part of the thighs. Colour above dull olive-green. Below whitish, and the membranes of the toes dusky.

Head and body 3·6; hind limb 6·5 inches. Inhabits Tenasserim.

*Ixalus*, *Duméril et Bibron*.

Characters of *Polypedates*, but without vomerine teeth, and of a smaller size.

*I. LATERALIS*, Anderson.

Olive above, slightly tinged with green; below yellowish, marbled with brown. Sometimes a triangular patch, with its apex directed backwards, between the eyes. The web of the foot is prolonged as a fringe or border along the toes. Bhamo.

*I. KAKHIENSIS*, Anderson.

Tympanum less than half the size of the eye. Disks large, and blackish. Toes, except the fourth, fully webbed. The wrist nearly reaches the snout. The heel reaches a little beyond it. Above dark olive-black, paling on the limbs to brown, banded with blackish-brown. Throat, chest, and sides marbled with brown, and whitish. Belly yellowish, obscurely brown-spotted.

Length of body 0·93 inches; fore-limb 0·57; hind 1·62.

Inhabits fields in the Nampong Valley at 1000 feet.

*I. TUBERCULATUS*, Anderson.

Eye rather large, with finely tubercular eyelids. The tympanum one-fourth as large as the eye. The wrist and heel both reach the tip of the snout. The disks of the fingers are larger than those of the toes, which are feebly webbed. Colour above uniform dark olive. The small tubercles white. Sometimes a yellowish interocular band. A black spot on the groin extending up the side, with two yellow spots. Legs banded. Elbow yellow. Sides of snout and upper lip marbled yellowish and olive, and lower lip and chin yellowish and brown. Chest and belly yellow, finely punctated with brown.

Length 0·80; hind limb 1·35 inches.

Marshy flats on the Nampong River, in the Kakhyen Hills.

*I. CINERASCENS*, Stoliczka.

Body small, stoutish, moderately depressed, above with a few scattered tubercles; below on chin and throat smooth; on the belly, and the lower side of the femora, very densely and coarsely tuberculated, the tubercles being flattened and more or less distinctly polyhedral. Snout short, obtuse, shorter than eye, but equal to the length of the exposed pupil, or to the distance between the eyes, which are very prominent; nostrils rounded, very slightly swollen and somewhat laterally placed below the indistinct canthus rostralis; tympanum quite indistinct; a fold runs from the upper eyelid posteriorly to the shoulder. Fingers quite free, elongated with well-developed swollen discs, which are only slightly smaller than those on the toes, the latter being barely half-webbed; metatarsus with a small inner tubercle and a very indistinct one at the base of the fourth toe; no fold on the tarsus. Tongue broadly oval, distinctly notched behind; eustachian openings small and very wide apart.

Colour above olive ashy, very minutely freckled with dark, paling at the sides; a broadish somewhat indistinct band between the eyes, one irregular band on each side of the back, legs and arms 3-banded, the middle band being in each case broadest and most distinct; a spot on the knee, a few small spots on the tarsi and toes, and a large spot round the anus are dark ashy, often encircled with a more conspicuous enlarged black line; shoulder fold, a few small spots on the lips, one spot on the side of the posterior belly, followed, and partially encircled, by a silvery yellow tinge, the inner basal half of the femora, and, to a great extent, also their hinder side, and the

toes internally are blackish. Below pale brownish white, somewhat purer on chin and throat, and all over finely speckled and punctated with dark.

The specimens examined appear to be quite full grown; the largest measures only  $\frac{3}{4}$  of an inch. Inhabits Maulmain.

*HYLA, Dumeril et Bibron.*

Differs from *Polypedates* in the tongue being entire, or but feebly notched behind. Males with vocal sacs.

*H. CHINENSIS, Günther.*

Tympanum one-third as large as the eye. Fingers partly, toes fully webbed. A distinct fold across the chest. Vomerine teeth in two small groups between the hinder part of the choanae. Above uniform green, below white. Some black spots on the sides, loins, and thighs. A dark band from the snout to the tympanum.

Length 1·8 inches. Inhabits Mouien in Yunnan.

### Toads.

#### Family **Bufonidæ.**

*BUFO, Laurenti.*

Skin warty. Parotoids swollen. Tongue free, entire. Fingers free. Toes partially webbed. Teeth none.

*B. MELANOSTICTUS, Schn.*

The common toad of India attains a large size in Burma, one specimen from Maulmain measuring 6·5 inches (Stoliczka, J.A.S.B. 1870, p. 157). It is also found in the Nicobar and Andaman Islands.

*B. ASPER, Schn.*

Tympanum distinct, but very small. A conspicuous groove along the vertebral line. A cutaneous fold along the inner side of the tarsus. The physiognomy of this species, says Günther, is "very peculiar, in consequence of the prominent eyes and of the short snout, with angular canthus rostralis and perfectly vertical loreal regions." Grows to 5·5 inches or more.

Ranges from Borneo as far north as Mergui.

Toads are useful animals, especially in gardens, where they destroy slugs and insects. They would seem to be capable of appreciating the kindness and protection of man, or in other words of being easily tamed. In Maulmain a very large toad used to come up every night into the verandah of the house in search of insects, and was frequently taken up in the hand and inspected, but evidently felt himself quite at ease, and at home as it were. He was once seized by a large snake, but his lusty croaking brought him speedy succour, and he escaped for the time with a good fright. He eventually disappeared after a visit paid me by a friend who was making a 'collection,' and who I fear was tempted by my poor toad's size and beauty to slip him into one of his store jars.

"En iterum crudelia retro

Fata vocant, conditque *nutantia* lumina somnus."—Georgic IV. 495.

## Class REPTILIA.

Cold-blooded vertebrata, which breathe by means of lungs throughout life, and undergo no metamorphosis. The body covered with plates or scales. One occipital condyle.

## Order OPHIDIA.

Body slender, cylindrical, covered with horny scales, no external limbs. No eyelids. Mouth dilatable. Tongue bifid. All the bones composing the upper and lower jaws are movable, and united by ligaments or muscles, and not by cartilage. This peculiar structure enables the mouth to be enormously dilated (Pascoc). Reproduction oviparous or viviparous. Vent linear, transverse. Tongue and reproductive organs bifid.

## HARMLESS SNAKES.

"Innocuous serpents (writes Dr. Mason) are very numerous from the diminutive blind worm, that hides itself in its burrow, to the gigantic python that displays its coat of many colours on the tree tops, ready to dart upon any animal that seeks the shade. The Burmans have marvellous myths concerning the 'blind snake' and the short-tailed earth snakes. They say that each snake has a head at each end, and runs at pleasure either backwards or forwards. Cut one in two and immediately one half runs off in one direction and the other in an opposite direction. More than this, I had a Burman before me who by some misadventure killed one of these snakes, and immediately, he knew not how, two others appeared by the side of the dead one. Others say this snake has a head and tail, but that they change places every six months. It can throw itself six feet at a jump against an elephant, and as soon as it strikes, the elephant reels from one side to the other, and immediately falls down dead. Hence one of the common names is 'The snake that shoots the elephant.' On account of its power of self-multiplication it is called 'Father of the birth of many.'"

It is not quite clear to which of the two snakes mentioned above (*Typhlops* and *Cylindrophis*) the above legends apply. Doubtless they are applied loosely to more snakes than one, just as in India the name 'two-headed snake' is applied to *Eryx*, though in Burma, where *Eryx* is not known, the name with its nexus of myths is bestowed on *Typhlops* or *Cylindrophis*.

Of reptiles as food, Dr. Mason writes: "The reptiles form a much more important branch of Zoology in a tropical country like Burma than they do in a temperate land like England. Both their number and variety are vastly increased. Their utility for food is very considerable to the natives of this country. All the tortoises and turtles are eaten, and the crocodiles, saurians, snakes and frogs are not wanting in a Karen's bill of fare. Still, if man's olfactory nerves were given to aid him to select his food, as they seem to have been, there is little of the flesh of reptiles that can fairly pass muster." The above verdict of Dr. Mason is, I think, too sweeping, though raw snakes have a repulsive odour. As I have probably consumed more reptilian flesh than Dr. Mason, I may perhaps be allowed to observe that most tortoises and turtles are good eating, and their flesh, and that of lizards, is not more offensive when raw, than fish, and incomparably less offensive than the odour evolved from the fresh and roeking flesh of either man or monkey.

*Family Typhlopidae.**Typhlops, Dumeril et Bibron.**T. Horsfieldii*, Gray.

Fronto-nasal in contact with the second labial. Nasal and fronto-nasal united. Colour dark blackish-olive above, passing to dull yellowish on the belly. Grows to 17 inches.

Ranges from Assam to Tenasserim.

*T. boturiornrhynchus*, Günther.

Fronto-nasal in contact with the second labial. A round groove larger than the nostril in the suture between the nasal and fronto-nasal. A smaller groove on the suture between the rostral and nasal. Colour uniform brown. Grows to 11 inches. Has been taken at Hurdwar, Assam and Pinang.

*T. ANDAMANENSIS*, Stol.

Fronto-nasal in contact with the second labial. Nasal and fronto-nasal separated by a suture above and below. Fronto-nasals do not meet behind. Colour brownish-black above, sides vinaceous. Below paler, white-mottled.

Inhabits the Andamans.

*T. BURMANUS*, Stoliczka.

Fronto-nasal in contact with the second labial. Fronto-nasals just touch each other in a point behind the rostral. Nasal separated from the fronto-nasal by an extremely fine short suture. Colour vinaceous black above, paler on the sides, yellow below. The snout in front pale yellow.

Inhabits Maulmain.

*T. BRAMINUS*, Daud.

The fronto-nasal separated from the labials by the nasal and præocular shields. Nasal separated from the fronto-nasals, but in contact with the præocular. Colour uniform brown, paler below. Grows to 8 inches.

Inhabits India and Burma.

These snakes are rather difficult to distinguish from each other, especially if much injured, as their specific characters are mainly minute differences in the arrangement of the head shields. In all species the scales are smooth and imbricate, the eyes rudimentary and covered by the head shields, the upper labials four, and the cleft of the mouth inferior and very small. In spite of this helpless organization, they are regarded generally with much awe in India no less than in Burma.

*Family Tortricidae.**CYLINDROPHIS, Wagler.**C. REUFUS*, Laur.

Nostril in a single nasal. Nasals united behind the rostral. Eye surrounded by a supraorbital, a postocular, two labials and a frontal. Colour brown. Belly with white cross-bands (perhaps red seasonably). A red collar and red below the tail. Scales 19 to 21 rows. Grows to 30 inches.

Inhabits Pegu and Tenasserim.

"Under certain circumstances" (writes Dr. Mason) "the Burmans say the bite of this serpent is fatal. These are five: *gnan-soung*, *loo-soung*, *young-soung*, *lan-soung*, *ne-soung*. 'Snake oblique, man oblique, turban oblique, road oblique, and sun oblique.' That is, if the snake approaches a man with its head askance, as this snake is always said to do, and the man look at it askance, and if his turban be put askance, and he be moving on the road askance, and the sun be askance descending in the heavens; when these five circumstances meet, if the snake bite, which by the way is always very improbable, death will certainly ensue!"

*Family Xenopeltidæ.*

Scales in 15 rows, polished. Eye small. A mental fold.

*XENOPELTIS*, Reinwardt.

*X. UNICOLOR*, Rein.

Scales in 15 rows, large and polished. Præocular large, replacing the absent loreal. Five occipital shields. Colour uniform steel blue splendidly iridescent, below whitish. Young specimens have a white head. Grows to 50 inches. Inhabits Pegu and Tenasserim. This is a thick-set, repulsive and venomous-looking snake. It is one of those harmless snakes which have no *loreal* shield.

*Family Calamaridæ.*

*CALAMARIA*, Boie.

*C. SIAMENSIS*, Günther.

Scales smooth, in 13 rows. Upper labials 4. One pair of frontals. Loreal absent. Colour olive, or fleshy grey, with eleven narrow black lines down the back, the vertebral and alternate lines thicker than the rest. A yellow collar behind the head, and another black-edged yellow collar below it. Grows to 9 inches.

Inhabits Pegu.

*Family Oligodontidæ.*

*SIMOTES*, Dumeril et Bibron.

Scales smooth, in 17 to 19 rows. Two nasals. Head symmetrically ornamented.

*S. CRUENTATUS*, Theobald.

Scales smooth, in 17 rows. Loreal small. Seven upper labials. Anal bifid. Colour above uniform umber brown; beneath yellowish-white, with numerous square black blotches. Tail beneath bright red, black-mottled. Grows to 15 inches.

Inhabits Pegu.

*S. THEOBALDI*, Günther.

Scales smooth, in 17 rows. Loreal elongate. Eight upper labials. Anal bifid. Colour brown, with a pale vertebral streak, and a pair of light lines down the back along the fifth outer row of scales. The back marked by reticulated black streaks.

Inhabits Pegu.

*S. MCATEXATUS*, Günther.

Scales smooth, in 19 rows. Two præoculars. Anal entire. Colour variable, brown, pale brownish-salmon, or uniform brick-red. A pale vertebral line, and a second below it on the side. Scuta with dark marginal dots. Grows to 31 inches.

Inhabits Pegu and Tenasserim.

*S. AMABILIS*, Günther.

Scales smooth, in 19 rows. One præocular. Anal entire. Back barred with over forty narrow black-edged yellow cross-bars. Below white, with an irregular series of blackish spots along either side of belly. Young only known.

Inhabits the Arakan Hills.

*Family Colubridæ.*

Head distinct. Eye moderate or large. Pupil round. Subcaudals divided. A mental groove.

*ABLABES*, Günther.

Scales smooth, in 13 to 17 rows. Anal bifid. Teeth numerous, equal.

*A. scriptus*, Blyth.

Scales smooth, in 13 rows. Colour above brown, with a few black dots on either side of the spine anteriorly. A white collar on the nape. Beneath white.

Inhabits Martaban.

*A. bistrigatus*, Günther.

Scales smooth, in 17 rows. Præocular 1. Postoculars 2. Upper labials 10. Fourth, fifth, and sixth enter the orbit. Head black, emitting on either side a distinct black band continued to the end of the tail. A yellow dot on each occipital and two on the nape. A chain of black spots on the neck, continued as dots to the tip of the tail. Back ruddy brown, paling behind. Sides grey. Belly yellow. Anal divided.

Body 7·8; tail 3·0 inches.

Prome.

*A. collaris*, Gray.

Scales smooth, in 17 rows. Præocular 1. Postoculars 2. Labials as in the last. Loreal longer than high. The occipital does not reach to the lower postocular. Colour brown above, white below. A vertebral series of black spots, anteriorly. Two black bands across the head. A yellow-margined black collar on the nape. Ventrals with a black splash at either end, and anteriorly a pair of median dots. Grows to 32 inches.

Inhabits the Arakan Hills and Upper Burma.

*A. nicobariensis*, Stol.

Scales smooth, in 17 rows. Light brown, with two white longitudinal bands commencing from a broad black collar and fading posteriorly. Each band is broken up by a series of quadrangular equidistant black spots. Lips yellow. A black band from the eye to the gape. Belly white, each ventral with a black side dot.

The Nicobars, where it seems to be the local representative of *A. melanocephalus*.

*COLUBER*, *Linnaeus*.*C. nuthalli*, Theobald.

Scales smooth, in 23 rows. Colour reddish grey, with four rows of elongate rhomboidal black spots, each inclosing a pale centre. These spots disappear posteriorly and are replaced by four deep brown bands. An oval black spot between the eye and gape.

Inhabits Pegu.

*ELAPHS*, *Dumeril et Bibron*.

Scales keeled. Ventral shields over 200. Nasals two. Pupil round. Maxillary teeth equal.

*E. yunnanensis*, Anderson.

Scales on the body in 23 rows. Ventral scutes from 252 to 258. Colour bright olive yellow, darker on the upper surface of the head. A narrow black line from behind the eye of the neck. A series of irregular elongated black spots down each side of the vertebral line, anteriorly connected by a narrow black area, and sometimes forming yellow-centred ocelli. Posteriorly a broad yellow vertebral band to the end of the tail. Behind the twenty-fifth ventral come in some 12 or 14 yellow-centred black rings, replaced posteriorly by dark brown oblong spots, which become confluent on the tail. Some of the ventrals laterally dark marbled.

Body 48·17; tail 11·0=59·17 inches.

Momien.

*COMPSOSOMA*, *Dumeril et Bibron*.*C. melanurum*, Schl.

Scales keeled, in 19 rows. Colour anteriorly brown, posteriorly black. Belly yellow before, black behind. A yellow vertebral band, broadly edged with black, behind the neck. Grows to 65 inches.

Inhabits the Malayan Archipelago and the Andamans.

*C. RADIAUM*, Schl.

Scales keeled, in 19 rows. Colour pale but rich red brown. Behind the head four black stripes commence abruptly and taper off to about the middle of the body. Sides of the body dark slaty, extending to the belly. Beneath tail, yellowish. Grows to 76 inches.

Inhabits Assam, Pegu, Tenasserim, etc.

This is the 'rat snake' of Europeans in Burma. Mason remarks "The Karens call it the 'striped squirrel snake,' because they say its markings resemble those of the striped squirrel. One that dropped from the roof of my house into the dining room, on being attacked by a cat, defended itself furiously and came off victorious. I have seen them in the act of swallowing rats twice the circumference of their own bodies." When one of these snakes has got into the roof of a house, the fact is often made known by the uneasiness of the rats, who may be seen hurrying backwards and forwards along the beams, often with their young in their mouths, transplanting them from one end of the house to the other, and not unfrequently dropping a calow rat, in their haste and fright, on to the table at which one may be writing or taking tea.

*PITYAS*, Fitzinger.*P. HEXAGONOTUS*, Cantor.

Scales smooth, in 17 rows. The vertebral row enlarged. Loreal one. Colour brown above, yellowish below. Grows to 62 inches.

Inhabits Arakan and the Malayan Peninsula.

*P. MICROSTUS*, L.

Scales in 17 rows, some 7 of which are keeled, and the vertebrals rather enlarged. Three loreals. Colour brownish olive, the scales dark-edged, especially behind, where the body and tail have in consequence a reticulated appearance. Grows to 91 inches.

Inhabits all India and Ceylon, the whole of Burma and its islands, and the Malayan countries.

*P. KORROS*, Rein.

Scales smooth, in 15 rows. Vertebrals not enlarged. Scales faintly keeled posteriorly. Two loreals. Colour the same as the last. Grows to 86 inches.

Inhabits Assam, Arakan, Pegu, Tenasserim and the Malayan countries.

*TROPIDONOTUS*, Kuhl.*T. PUNCTULATUS*, Günther.

Scales smooth, in 15 rows. Colour very variable. Adult males above dark amber, below white, the two colours sharply separated. Upper labials white. Adult females light brown, much mottled with yellow, which sometimes predominates.

Inhabits Pegu.

*T. ZEBRINUS*, Blyth.

Scales smooth, in 15 rows. Nape black-banded. Colour plumbeous, black-spotted. Sides barred with black bars, and a white spot above. Young only known.

Inhabits Mergui.

*T. ANGUSTICEPS*, Blyth.

Scales keeled, in 17 rows. 8 upper labials. Præoculars 2, 3 or 4. Postoculars 4 or 5. Colour above plumbeous, uniformly spotted with black. Grows to 41 inches.

Inhabits Assam and Arakan.

*T. MACROPS*, Blyth.

Scales keeled, in 17 rows. 8 upper labials. 1 præocular. Colour uniform brown, or with a dorsal series of reddish-brown spots. Neck with an indistinct arrowmark. Belly marked anteriorly with large quadrangular brown spots, posteriorly blended with brown. Neck sometimes greenish, and body with black and yellow reticulations. Grows to 39 inches.

Inhabits Sikkim, the Khasi Hills, and the Pegu Range west of Toung-ngoo.

*T. MICROCIXETUS*, Blyth.

Scales keeled, in 17 rows. 8 upper labials, the penultimate and antepenultimate upper labial very large. Colour reddish brown, passing into greenish on the neck and head. Some 50 narrow black bars across the back. Grows to 27 inches.

Inhabits Pegu and Tenasserim.

*T. QUINCUNCIATUS*, Schl.

Scales keeled, in 19 rows. 9 upper labials, the fourth and fifth enter the orbit. Nostrils valvular. Colour variable. Above grey, brown or greenish olive, with from three to seven rows of black spots down the body in quincuncial order. Sometimes red spots are present, and in the young dark bars. Sometimes in place of the black spots there are dark lines and yellow spots. Grows to 51 inches.

Inhabits all India and Burma, and the Malayan countries, the Andamans, etc.

*T. JUNCERIS*, Cantor.

Scales keeled, in 19 rows. Nine upper labials, the fourth, fifth, and sixth entering the orbit. Colour greyish-olive, with a row of whitish spots on each side of the back. Grows to 27 inches.

Inhabits Assam and Pinang (and no doubt Burma).

*T. BELLULUS*, Stoliczka.

Scales keeled, in 19 rows. Nine upper labials, the fourth, fifth, and sixth entering the orbit. Colour olive brown, with two series of black dots along the back. Præocular and postoculars bright yellow. Ventrals and subcaudals black-edged.

Inhabits the Pegu Range west of Toung-ngoo.

*T. MODESTUS*, Günther.

Scales in 19 rows. Nine upper labials, the fourth, fifth, and sixth entering the orbit. Ventrals 151 to 168. Subcaudals 82 to 122. Uniform olive brown. Below yellow. Each ventral black dotted at its angle, the spots confluent posteriorly. A narrow pale olive-yellow lateral band anteriorly. In one male from Yunnan the subcaudals were entire.

Ranges from the Khasi Hills to Western Yunnan.

*T. SUBMINIATUS*, Rein.

Scales keeled, in 19 rows. Eight upper labials, the third, fourth, and fifth entering the orbit. Colour olive-brown, passing into yellowish-green on the neck and head. Body anteriorly handsomely reticulated with black and yellow. In the young a black collar on neck. Grows to 42 inches.

Inhabits Assam, Pegu, Tenasserim and Bengal.

*T. STOLATUS*, L.

Scales keeled, in 19 rows. Eight upper labials, the third, fourth and fifth entering the orbit. Colour brownish-olive, with numerous reticulated cross-bars, intersected by two pale buff or stone colour dorsal bands. Seasonably, the colours are brightened with red and yellow. Grows to 24 inches.

Inhabits all India and Burma.

*ATRETIUM*, Cope.*A. SCHISTOSUM*, Daud.

Scales keeled, in 19 rows. A single triangular prefrontal. Colour above dark blackish olive, below yellowish. Grows to 25 inches (or more).

Inhabits the Malayan Peninsula, India, and probably Burma.

*Family Homalopsidæ.*

Nasals large. Nostrils valvular. Head shields often modified and irregular. Posterior maxillary fang grooved.



GERARDA, *Gray*.

G. BICOLOR, Gray.

Scales smooth, in 17 rows. A single præfrontal. Eye over the fourth labial. Colour above muddy. Belly pale. Grows to 11 inches.

Inhabits Pegu.

CANTORIA, *Gerard*.

C. DAYANA, Stoliczka.

Scales smooth, in 19 rows. A single præfrontal. Eye surrounded by a circle of plates. Body long and slender. Colour above dull yellow, with numerous dark bands. Below pale yellow, with a dusky greenish hue along the centre. Grows to 30 inches.

Inhabits the estuaries of Pegu.

FORDONIA, *Gray*.

F. BICOLOR, Theobald.

Scales smooth, in 25 rows. 5 upper labials, the eye over the fifth. One præfrontal. Colour yellowish grey, dark spotted. Sides and belly white. Colours distinctly separated.

Inhabits Pegu.

F. UNICOLOR, Gray.

Scales smooth, in 25 to 29 rows. 5 upper labials, the third entering the orbit. Colour above dark ash. Sides and belly white. Grows to 25 inches.

Inhabits Pinang.

HYPSIRHINA, *Wagler*.

H. PLUMBEA, Boie.

Scales smooth, in 19 rows. A single præfrontal. Colour brown, with a dark-edged yellow stripe. A median dotted line down the belly, and a dark line along the ends of the ventrals and along the junction of the subcaudals. Grows to 21 inches.

Inhabits Upper Burma and Pegu.

H. ENHYDRIS, Schn.

Scales smooth, in 21 rows. A single præfrontal. Colour variable. Hair-brown above, olive tinted, and with a blue iridescence. A pale stripe down each side, margined above and below with a dark line. Sides and belly whitish. Along each side, above the scuta, a stripe of pale salmon red. Scuta and scutellæ dark-edged. Grows to 28 inches.

Inhabits Pegu and Tenasserim.

H. MACULATA, W. Blanford.

Scales smooth, in 25 rows. A single præfrontal. Colour blackish-ashy, with three rows of irregular dark spots down each side, and a blackish band along the margins of the ventrals.

Inhabits the Bassin River.

FERANIA, *Gray*.

F. SIEBOIDII, Schl.

Scales smooth, in 29 rows. Two very small præfrontals. Thirteen lower labials, the sixth the largest. Colour pale brown, with over 30 large brown black-edged spots down the back, and below a row of alternating triangular brown spots. Belly and sides yellow. Belly black-chequered. Grows to 25 inches.

Inhabits Pegu, and probably all Burma.

HYPISTES, *Gray*.

H. HYDRINUS, Cantor.

Scales smooth, in 39 rows. Lorcal large. 7 upper labials, the fourth being below the suture of the præ- and postoculars. Ventrals sharply keeled. Colour greenish

yellow above, broadly barred with dark grey. Sides and belly white or yellowish. Grows to 21 inches.

Inhabits the tidal rivers in Burma.

The colouration of this snake strongly resembles that of the poisonous sea snakes, but the presence of a loreal shield proves it is harmless. It is captured with numbers of sea snakes in the sluice nets in the Bassein River below Gnaputau.

*CERBERUS, Curier.*

*C. RHYNCORUS.*

Scales keeled, in from 24 to 25 rows. Nasals two. Eye surrounded by a ring of small orbitals. Snout only shielded: occiput scaly. Loreal as large as a postocular. Colour blackish ash with a greenish tint, and irregular black cross bars. The outer rows of scales yellowish. Grows to 4 feet, though usually much smaller.

Inhabits the coasts of India and Burma.

This is a repulsive and venomous-looking snake, but its loreal shield shows its harmless nature.

*HOMALOPSIS, Gunther.*

*H. BUCCATA, L.*

Scales striated and keeled, in 37 to 47 rows. Nasal single. Eye surrounded with a ring of small orbitals. Colour brownish-olive, with narrow grey black-edged cross bars. A brown patch on the snout, a round spot on each side of the occiput and a streak from the eye to the neck. Belly and outer scales yellowish, usually a row of black spots along the sides of the belly. The head shields are usually very irregular and the colours also. Grows to 42 inches.

Inhabits Pegu, Tenasserim, and the Malayan Peninsula.

#### Family **Acrochordidæ.**

*CHERSYDRUS, Curier.*

*C. GRANULATUS, Schm.*

Tail compressed vertically as in the sea snakes. Scales tubercular in over 100 rows, those of the belly forming a serrated ventral keel. Colour above grey descending in stripes to the belly, below yellow, ascending in stripes to the back. Grows to 37 inches.

Inhabits the sea and estuaries of Burma.

This wholly aquatic species closely resembles the sea snakes, and like them is viviparous. The greater number of its rows of scales serves to distinguish the species.

#### Family **Psammophidæ.**

*PSAMMOPHIS, Boie.*

*P. CONANTURUS, Merr.*

Scales smooth, in 17 rows. One præocular. Two postoculars. Nasal single, oblong, pierced posteriorly by a moderate nostril with an oblique slit to the first labial. 8 upper labials, the fourth and fifth entering the orbit. Colour buff or yellowish, Isabelline brown (the colour of the dirty smock of Isabella the "catholic"), with a dark stripe two scales broad down either side of the back, and a broader dark stripe down either side of the belly. Belly yellowish, colours strongly contrasted. Grows to 40 inches.

Inhabits Pegu and India. A very active snake.

*PSAMMODYNASTES, Gunther.*

*P. PULVERULENTUS, Boie.*

Viviparous. Scales smooth, in 17 rows. Two præoculars. Two postoculars. Nasal single. 8 upper labials, the third, fourth and fifth entering the orbit. Colour uniform dark umber brown, with some light reddish patches and black spots down the back. Throat, belly and tail brown. Some yellow about the sides. Throat and each alternate ventral white-spotted. Or sometimes uniform ochraceous, and below

bright yellow, with two dotted streaks of reddish brown along the sides. The head is short and lips swollen, and the snake is very venomous-looking. Grows to 21 inches. Inhabits Pegu and Tenasserim.

### Family Dendrophidæ.

Form compressed, elongate or slender. Head narrow, distinct. Snout obtuse. Eye moderate or large, with round pupil. Scales narrow, imbricate. Ventrals keeled.

*Gonyosoma*, *Wagler*.

*G. OXYCEPHALUM*, Boie.

Scales smooth, in 25 rows. Loral very elongate. 11 upper labials, the fifth and sixth or sixth and seventh entering the orbit. Colour uniform grass green, paler below. A dark loral streak. Grows to 90 inches.

Inhabits Tenasserim, the Andamans, etc.

*Dendrophis*, *Boie*.

*D. FICTUS*, Günther.

Form slender. Eye large. Scales smooth, in 13 or 15 rows. The vertebral series enlarged, the other scales narrow. Colour above bronze-brown, with a black-edged yellow band along either side. Belly yellowish or white. Grows to 48 inches.

Inhabits Assam, Pegu, the Andamans, etc.

*Chrysopellea*, *Boie*.

*C. ORNATA*, Shaw.

Scales smooth, in 17 rows. Vertebrae enlarged and ventral scutes keeled, almost tritid. Colour black, with bright gamboge spots. Sometimes a red tinge on the back or a series of red rosettes. Grows to 53 inches.

Inhabits Assam, Pegu, and Tenasserim.

### Family Dryiophidæ.

Form very slender. Snout pointed. A single nasal shield. Scales narrow, imbricate, in 15 to 17 rows. Pupil horizontal.

*Tragops*, *Wagler*.

*T. PRASINUS*, Rein.

Scales smooth, in 15 rows. Nasal single, pierced by the nostril posteriorly. 1 to 3 loreals. 9 upper labials, the fourth, fifth and sixth enter the orbit. Colour light green, sometimes yellowish or brown or pale grey. A white or yellow line runs along the edge of the belly. Skin chequered with white and black bars. Grows to 71 inches.

Inhabits Arakan, Pegu, and Tenasserim.

*T. FRONTICINCUS*, Günther.

Scales keeled, in 15 rows. Nasal very elongate, and separates the rostral from the prefrontals. 2 loreals. 7 or 8 upper labials, the sixth under the orbit, and some of the anterior ones horizontally divided. Colour green, or brown with a black line margined with white or yellow along the edge of the belly. Grows to 36 inches.

Inhabits mangrove swamps on the Arakan coast.

*T. JAVANICUS*, Stein.

Closely resembles *T. prasinus*, but the anterior upper labials are smaller, and the fifth and sixth only enter the orbit. Colour green, with four longitudinal white stripes on the belly.

Inhabits Java and Pegu.

*Passerita*, *Gray*.

*P. MYSTERIZANS*, L.

Scales smooth, in 15 rows. Loral none, replaced by the frontal, which is bent down to meet the labials. Snout long and pointed, and ending in a flexible appendage.

Colour bright green, paler below, occasionally brown. A yellow line along each side of the belly. Grows to 72 inches.

Inhabits India, Upper Burma, and Northern Pegu.

#### Family **Dipsadidæ.**

Body elongate, compressed. Head distinct, sub-triangular. Eye large, with vertical pupil. Scales smooth.

**DIPSAS.**

**D. MULTIMACULATA**, Schl.

Head triangular, body much compressed, vertically. Scales smooth, in 17 or 19 rows. The vertebral series enlarged. Colour pale reddish-olive, with a series of round brown spots, pale within, and bordered with white, down each side of the spine, and with a smaller and less distinct series below them. Grows to 35 inches.

Inhabits Pegu and Tenasserim. A very common and handsome snake.

**D. HEXAGONOTA**, Blyth.

Scales smooth, in 17 to 21 rows. The vertebrals enlarged. Colour red on back and sides. Below white. A black dot on the occipitals, and sometimes a black median streak anteriorly. Grows to 45 inches.

Inhabits Sikkim and the Andamans.

**D. OCHRACEA**, Theobald.

Scales smooth, in 17 rows. Vertebrals enlarged. Upper labials 9, the fourth, fifth, and sixth entering the orbit; the fifth small; the three next very large. Colour uniform dusky grey, or ochraceous. Below whitish. Grows to 35 inches.

Inhabits Pegu and Martaban.

**OPHITES**, *Wagler*.

Scales keeled, in 17 rows. Nostril between two shields. Pupil erect. An enlarged tooth anteriorly in both jaws.

**O. FASCIATUS**, Anderson.

The long loreal enters the orbit. One præocular. Two postoculars. 8 upper labials, third, fourth, and fifth entering the orbit. Scales feebly keeled, in 17 rows. Keels more pronounced posteriorly. Anal entire. Ventrals 213. Subcaudals 90. Body encircled by 55 broad purplish black bands, separated by reddish interspaces of half their width. Head above dark-brown.

Head and body 16·66; tail 4·34=21 inches.

Ponsee in Yunnan.

#### Family **Lycodontidæ.**

Eye small, with vertical pupil. Head somewhat elongate and depressed.

**LYCOPON**, Boie.

**L. AULICUS**, L.

Scales smooth, in 17 rows. Præfrontals very small. Loreal large, its anterior angle being inserted between the præ- and post-frontals. Nostril small, between two shields. Colour reddish brown, barred and reticulated with yellow or white. Sometimes uniform, without conspicuous markings. A collar on the nape in young individuals. Some specimens much resemble the poisonous *Bungarus caruleus*, but the loreal shield shows they are harmless. This is the 'carpet snake' of India, so much dreaded.

Grows to 24 inches, and ranges throughout India and Burma.

**ULUPE**, *W. T. Blanford*.

Body slender, compressed. Loreal and præocular united. Nasal one. Scales smooth, in 13 rows. Ventrals keeled. Pupil vertical.

U. DAVISONI, W. Bl.

Nostril small, rather anteriorly pierced in the nasal shield. A single præocular in contact with the nasal. Upper labials seven, the third and fourth entering the orbit. Colour above black, with white cross bands, a third as broad as the interspaces.

Length 22; tail 6; total 28 inches.

The type was from Nawlabu hill, east of Tavoy.

TETRAGONOSOMA, *Gunther*.

Body slender. Nasals two. Loreal none. Colour deep purple, marbled with white and black. Beneath pearly. The type specimen is lost, and the species has not been rediscovered.

Inhabits Mergui.

### Family Amblycephalidæ.

Body slender, compressed. Head short, thick, distinct. Nostril in a single shield. Eye moderate, with vertical pupil. Scales smooth or faintly keeled, in 13 to 15 rows, the vertebral row enlarged.

PARIAS, *Wagler*.

P. MARGARITOPHORUS, Jan.

Scales smooth, in 15 rows (or slightly keeled on the back). Nostril pierced posteriorly in a large shield. Loreal small. Eye surrounded by several small shields, which exclude the labials. Upper labials 6 or 7, the anterior ones very high and narrow. Three pairs of large transverse gular shields, the first forming a suture with the first four labials. Colour rich reddish-brown, with reticulate bars, formed by some particoloured scales, white in front, red behind. Belly brown-spotted and mottled. Grows to 24 inches.

Inhabits Tenasserim and Martaban.

P. MODESTUS, Theobald.

Scales smooth, in 15 rows. Postfrontals large, and bent over and entering the orbit. Loreal moderate. Præoculars 2, very small. Postocular 1, very small, with a band-like shield between the eye and labials. Upper labials 7, the sixth low, the seventh very long. Three pairs of large gular shields. Below pale yellowish.

Inhabits Rangoon.

### Family Pythonidæ.

Tail prehensile. Some of the labial scales pitted. A spur-like prominence on either side of the vent, indicating a rudimentary limb or style beneath the skin.

PYTHON, *Daudin*.

P. RETICULATUS, Schm.

The first five upper labials deeply pitted, and the ninth to the thirteenth lower labials. Colour clear grey, superbly reticulated with black, with a rich glossy lustre. The ground colour is seen as a series of oblique lozenges separated by black and yellow. Yellow is also interspersed, and on the sides forms irregular ocelli. Head yellow, with a median black streak and two black dots on the occiput. Grows to 30 feet.

Inhabits Burma and the Malayan Peninsula.

P. MOLURUS, L.

The two anterior upper labials are pitted, and four of the lower ones. Colour light greyish brown. A brown lanceolate spot on the crown and nape, its point resting on the frontals, its end on or behind the vertical. A pale median streak divides its broader portion. A vertebral series of large quadrangular spots, and an oblong spot on each side of the square ones. Along the sides another row of brown spots, sometimes with a light centre. Grows to 30 feet.

Inhabits India, Burma, and the Malayan Peninsula.

The gall-bladder of the python is much valued by the Karens for medicine, and Dr. Mason writes: "The Karens have an apophthegm that the largest python can swallow a full-grown buck rusa or 'sambur' deer, horns and all, without inconvenience. According to a Karen legend, all the poisonous serpents derive their virulence from the python, which, though innocuous now, was originally the only one that was venomous. In those days he was perfectly white, but having seduced away a man's wife, aunt Eu (Eyo), he made her, while she was in his den, weave figures on his skin in the forms which are now seen. At that time if he bit the footstep of a man in the road, such was the virulence of his poison that the man died, how far soever that man might have passed from the bitten track. The python had not, however, an ocular demonstration of the fact, so he said to the crow, 'Crow, go and see whether people die, or not, when I bite the foot-track.' The crow went to the neighbourhood of a Karen cabin, and found the people, as is their custom at funerals, laughing, singing, dancing, jumping, and beating drums. He therefore returned to the python, and told him that so far from his efforts producing death, on the contrary, they produced joy. The python was so angry when he heard this, that he ascended a tree and spit up all his venom, but other creeping things came and swallowed it, and people die of their malignancy to this day. The tree, however, from which the python spit up his venom became deadly, and its juice is used to this day for the purpose of poisoning arrows. The python made the other creatures promise not to bite without provocation. The cobra said, 'If there be transgression so as to dazzle my eyes, to make my tears fall seven times in one day, I will bite.' So said the tiger (whose bite the Karens esteem as virulent as a serpent's) and others, and they were allowed to retain their poison. But the water-snake and frog said they would bite with or without cause, as they liked; so the python drove them into the water, where their poison melted away and their bite became harmless."

According to Karen testimony, the female python incubates her eggs, covering both herself and them with leaves, in which she is assisted by the male, who remains on guard in the neighbourhood. Dr. Mason also says these snakes are occasionally killed by pigs; but this assertion would seem to require verification. The rarity of large-sized pythons is somewhat remarkable, considering the few enemies they have capable of coping with and destroying them. These creatures destroy their prey by suffocation. A rapid dart is made at the animal, and in an instant two or three coils of the snake's body are thrown round it. These coils are gradually tightened, so as to stop the breathing, and the animal dies suffocated in a few minutes. In the case of a large lizard, the time is longer, as these animals are more tenacious of life than a bird or mammal. When dead, the snake releases its victim from its folds, and takes the head into its mouth, gradually drawing itself over its prey. I have never heard of a case of a human being having been devoured, but no doubt such a thing is possible in the case of a large python. The flesh is much esteemed by the Karens as food.

## VENOMOUS SNAKES.

### *Family* **Elapidæ.**

A poison fang present. No loreal shield. Pupil round.

*Naja, Laurenti.*

Scales smooth, in 15 rows, on body; more numerous on the neck, which is more or less dilatate.

*N. TRIPUDIANS, Merr.*

Scales smooth, in 15 rows. Neck dilated into a hood, which is ornamented either by a 'spectacle' mark or an oval, the latter being the commoner form in Burma. Colour varies, pale yellowish or stone colour, pale brown, dark brown or black. Grows to 70 inches.

Inhabits the whole of India and Burma.

Dr. Mason writes: "Mr. Theobald is probably right when he says, 'This snake is I believe of inoffensive habits unless irritated';<sup>1</sup> but then it must be let alone, and no mistake, for the mistake may be fatal. On two or three occasions I have found it fight manfully when attacked; but it sometimes runs, and it has been known when pursued to clear a high pile of stones that obstructed its path. In May, 1871, I heard a disturbance among a litter of kittens in my dressing room, and on looking in, there was a cobra reared up in the form of a capital S, with its peculiar undulatory motions, at a young kitten, whose back was raised like a hedgehog's, and every hair seemed to stand out straight like the quills of the fretful porcupine, while it growled loudly at the snake and held its ground manfully. I was anxious to see the result of the fight, but after the sparring had continued at least two minutes, I incautiously approached so near the combatants that the cobra took the alarm, and ran under a box, leaving the kitten in possession of the field. With a view to bringing him out in front that I might get a blow at him, I threw a kitten in behind the box; but contrary to my expectation, he came out behind, and although I hit him, escaped down a hole in the floor. The kitten that I had thrown into his hiding-place walked feebly across the floor, staggered like one blind and laid quietly down and died without uttering a cry. The snake had struck it above the left eye, where there was a little swelling. In the evening I heard another disturbance among the kittens, and went into the room in the dark, not anticipating the return of the snake, when matters quieted down again. An hour afterwards another kitten was found dead. With such dangerous neighbours which we all have in the country, it is worthy of inquiry what is it that attracts them into our houses. A little Burman boy said that it was the kittens, and that he had two kittens devoured by snakes. There were two baskets of green mangoes in the room near to the kitten's nest, and our Tamil servant said that it was the mangoes which drew in the snake, and he fortified his opinion by quoting two deaths from cobra bites that had come to his knowledge among the Burmans, where the sufferers had thrust their hands into baskets of mangoes, and were bitten by cobras that had hidden themselves in the bottom of the baskets, and that within a few days the servants had turned up a cobra in a pile of mangoes in the mess house." The Burman boy may have been right, as a cobra could swallow a kitten as easily as a rat, or the snake might have entered the house in search of a dry spot, if the country outside was inundated. The wily Tamulian probably had his own reasons for wishing 'master' to keep his mangoes anywhere rather than in his own room. Dr. Mason adds: "The natives say the cobras make their homes in holes in the ground, but come into houses in search of food. In the forests they build nests of grass among rocks or under logs, and the snake charmers often take the eggs and raise from them docile snakes." This last observation is wholly incredible, no snake charmer that I ever saw being possessed of young cobras.

N. ELARS, Schl.

The Hamadryad.

Scales smooth, in 15 rows. Subcaudals bifid, except the anterior ones, which are single. Colour brown, with paler cross-bands edged with black. Throat yellow. Or some specimens greenish olive, with numerous oblique black and white bands converging towards the head. Belly mottled or blackish, with yellow throat. The young are black, with narrow equidistant white bands and head white-banded. Grows to 170 inches.

Inhabits India, Burma and Tenasserim.

Dr. Mason writes: "The Hamadryad is the most formidable reptile in the country. It may be described in general terms as a magnificent variety of the cobra. It has

<sup>1</sup> The entire passage runs thus. "This snake is I believe of inoffensive habits unless irritated, but is of course a dangerous neighbour to have in a house. Not only in Burma, where the respect for life is greatest, but in India also I have known a cobra, enticed or forced into an earthen jar and then carried by two men across a river, or some distance from the village, and then liberated. The professional snake charmers, I believe, in Burma liberate their snakes after a few weeks' captivity, to prevent, I suppose, their dying of starvation in their hands, and in deference to that tenderness for animal life, which is so charming a trait of Buddhism." *Linnean Society's Journal*, vol. x.

an expanded hood like the cobra, but has no markings on it. It bears the character of being a very fierce snake, and of always pursuing when attacked. I met one, on the Toungoo Hills, two or three years ago, when accompanied by a dozen Karens. We all stopped, and the brute being some ten or twelve feet long, no one was disposed to attack him. He glided close by us in a very deliberate manner, seeming to say, 'Let me alone, and I will let you alone,' and we accepted the terms. Mr. Theobald writes: 'I was once descending the Tenasserim River in company with Professor Oldham, and saw one of these snakes on the bank. Thinking it was a *Ptyas*, I hastily sprang ashore and caught it by the tail as it was disappearing in the brushwood. My boatmen, however, quickly handed me up a "Dah" and with two blows I severed my dangerous prize in half. That I was not bitten I attribute to the gentle manner in which I held the snake, without pinching it; but the risk was great, and such as it is better to avoid, as the animal measured twelve feet, and its bite might have been fatal in a few minutes. The excitement, however, generally gets the better of one's prudence when a fine specimen is to be secured, as the following instance will show: I was one evening attracted by a noise of men and dogs near my tent, and found a large crowd round a bush, in which some creature was at bay. On coming up I found it was a magnificent "Gnan" (*Hamadryas*) twelve feet long, which was making furious charges at the dogs, but was protected by the bushes among which it kept from the men, who moreover were very much disinclined to come very close. Taking a stick from a boy, I directed all present to go the other side of the bush and keep quiet, whilst I stationed myself a few yards in the open. As I anticipated, in a minute or so, the "gnan," thinking the coast clear, came straight out on my side, with the idea of escaping; and when he was well clear of the bushes, I made one step forward and delivered a smart blow on the neck, and before he could recover himself, I was upon him and had him firmly by the nape. He was quite unhurt, and I had a hard job to hold him, but managed to drag him to my tent, where I severed the spine at the nape with a penknife, to the admiration of the crowd, who were convinced that I had some powerful charm, to enable me to overcome the dreaded "Gnan."

Dr. Mason says, "One of these serpents, about seven feet long and one foot in circumference, was caught in Shwagyen, and after being secured to a bamboo, was brought to Major Berdmore. He sent for a famous Burmese serpent charmer, who met the brute on the verandah in the confident expectation of subduing it, by a few 'brays,' a bold front, and a shake of the finger. At first the serpent appeared to cower beneath his glance; but when he approached and put forth his hand, it sprang on his wrist and bit him. The man felt the poison up to his shoulder in an instant, and ran off immediately to his house, which was near, for an antidote; but he fell exhausted on the threshold, and expired in less than half an hour after he was bitten.

"The Karens say they are sometimes three fathoms long, but from ten to twelve feet is the most common length of adults. A Karen at my side says that on three several instances he has seen a *Hamadryad* devouring other snakes, so one of its specific names 'ophiophagus' (snake-eater) is most appropriate. An intelligent Burman told me that a friend of his one day stumbled upon a nest of these serpents, and immediately retreated, but the old female gave chase. The man fled with all speed over hill and dale, till reaching a small river he plunged in, hoping he had then escaped his fiery enemy, but lo! on reaching the opposite bank, up reared the furious *Hamadryad*, its eyes glistening with rage, ready to bury its fangs in his trembling body. In utter despair he bethought himself of his turban, and in a moment dashed it upon the serpent, which darted upon it like lightning, and for some moments wreaked its vengeance in furious bites, after which it returned quietly to its former haunts. Yule wrote (*Embassy to Ava*, page 180): 'At about a mile from the Coal we came upon a large *Hamadryad* snake. One of the men had a double-barrelled gun, but when he attempted to fire at it, all the rest cried to him to stop. I said, "Shoot him!" but the snake looked at us and glided away unhurt. I asked him why he did not shoot it. The reply was curious as bearing out a statement in Mason's "*Tenasserim*," which I confess I did not credit before. They said it would, if hurt, turn after and chase them; so it got off. It was about 9 feet long.' The Burmese word '*gnan*' is used generically to denote both the '*Hamadryad*,' the



'Bungarus,' and the 'rat-snake,' the different species being distinguished by qualifying adjectives, and the same snake has sometimes two or three specific names. Thus the Hamadryad is most usually called '*guan pouk*,' 'the dark guan,' particularly applicable to the dark colour of old individuals. The name '*guan*' is derived from the word '*guan*,' signifying, 'a certain venomous influence supposed to occasion certain diseases' (Judson's dictionary). It cannot therefore be appropriately applied to any but venomous serpents; but owing in part to want of discrimination, and in part to ignorance, the name is often applied to others."

*CALLORHIS*, Gray.

Scales smooth, in 13 rows. Caudal shield in two rows.

*C. INTESTINALIS*, Laur.

Scales smooth, in 13 rows. A red vertebral stripe bordered with black. A buff-coloured band bordered with black along the edges of the two outer rows of scales. Head brown, black-spotted. Belly barred alternately yellow and black, the black bars being broadest. Tail with three black rings generally. Grows to 24 inches.

Inhabits Upper Burma.

This species is remarkable for the extraordinary development of its poison glands, which are somewhat more than one-third the length of the body, running along the ventral side, and occupying laterally the alimentary and respiratory canal. (J. A. S. B. 1870, ii p. 212.) *C. linigatus*, Boie, is the only other species known to possess the same remarkable structure, and it is readily known by its immaculate vermilion head, belly and tail.

*C. TRIMACULATUS*, Daud.

Scales smooth, in 13 rows. Colour above light bay, an indistinct line formed by minute brown dots along each row of scales. Head black and yellow-spotted. Belly red. Tail with two black rings, mottled with yellow. Grows to 12 inches and probably more.

Inhabits Tenasserim.

*C. MACULICEPS*, Günther.

Scales smooth, in 13 rows. Colour uniform pale brown, with a chain of 36 distant black dots down each side of back. Head and a collar on the nape black. A sub-terminal black ring on the tail, and a black median line and a black band at the base of the tail expanded above into a rhomboidal esentelicon. Grows to 24 inches.

Inhabits Pegu and Tenasserim.

*BUNGARUS*, Daudin.

Scales smooth, in 13 to 15 rows. Caudal shields single or entire.

*B. FORMOSUS*, Gray.

*B. flaviceps*, Rein.

Scales smooth, in 13 rows. The vertebral series enlarged. Colour black. The head, neck, and a thin vertebral line bright red. Belly red, or red posteriorly, black in front. Gray's name for this snake is preferable, as '*flaviceps*' is only applicable after the animal has changed colour from keeping in spirits. Grows to 73 inches.

Inhabits Tenasserim and according to Dr. Mason Young-ngoo.

*B. CÆRULEUS*, Schn.

Scales smooth, in 15 rows. The vertebral series enlarged. Colour above glossy black, with extremely narrow white reticulated cross-bands, often obsolete or indistinct. Grows to 48 inches.

This snake is rare in Burma, but occurs in Pegu and the Andamans. It is the 'Krait' of India, so justly dreaded, and is not unlike some of the varieties of the harmless *Lycodon aulicus*, or carpet snake, which may account for the dread that snake is held in. It also somewhat resembles the repulsive-looking *Xenopeltis unicolor*, but that species has five occipital shields, and no pale reticulations.

*B. fasciatus*, Schn.

Scales smooth, in 15 rows. The vertebral series enlarged. Body banded alternately black and yellow. Head black. Throat and belly yellow. Grows to 90 inches. Inhabits Pegu and Tenasserim.

It is called by the Burmese 'Gnān-thān gwīn-zok.'

Mason says, 'The Karens call this snake the 'Necklace snake,' because they say it resembles a necklace of black and white beads. When they go up the streams at night with lights, and smite the fish that are attracted to the light, this snake often follows them, but never does them any harm. The snake seems to be fascinated by the light as well as the fish.'

## VIPERINE SNAKES.

These snakes are characterized by a long tubular poison fang on a short maxillary bone, and keeled scales; a stout habit of body, and a repulsive physiognomy. They are divided into two families, Vipers and Pit-vipers, the latter being provided with a pit in the loreal region. Viviparous.

### Family *Viperidæ*.

*No loreal pit.*

*DABOLA*, Gray.

*D. RUSSELLI*, Shaw.

Scales strongly keeled, in 29 to 31 rows. Head covered with scales. Colour greyish or reddish-brown, with three rows of black, white-edged annular ocelli down the back and sides, the vertebral ones ovate, the outer ones circular, with some smaller supplementary ocelli interspersed. Two pale lines from the snout, over the eyes, to the temporal region. Belly yellowish, marbled with brown, with numerous semicircular spots on the hinder margins of the ventrals. Grows to 54 inches.

Inhabits the whole of India, Arakan, and Pegu, but not recorded with certainty from Tenasserim.

This snake is the '*tie polonga*' of Ceylon, '*Chunda bora*' of Bengal, the '*Cobra monil*,' or necklace snake, of early writers. Dr. Mason writes—"This viper is called by the Burmans '*Myce-bwie*,' which signifies '*ringworm snake*,' so named because the spots on its skin are supposed to resemble 'ringworms.' It is generally found in sunny places near the foot-paths. Mr. Cushing encountered it repeatedly in the Shan states. On one occasion he killed a portly old fellow, while sunning itself on the banks of a small lake; but it almost proved to Mr. Cushing as great a mistake as Ptolemy's soldier made, when he killed a cat in Egypt, for the Shans declared it was the guardian spirit of their lake, that he had the freedom of the country given him, to go and come when and where he liked, and that he never abused his liberty by biting any one. He was, in fact, their tutelary deity.

"While travelling in the Shan state of Zimmay, half a day west of Merughaut, on one occasion Mrs. Cushing laid down in the shade to rest, in the middle of the day, but was woken from her slumbers, by feeling something crawling over her, up from her feet. The idea that it was a snake suggested itself at once, and she lay perfectly immovable while it crawled deliberately up over her arm, and then actually over one side of her face, and off over the temple. As it dropped its tail from her head, human nature could restrain itself no longer, and she jumped up and screamed, just in time to see a large spotted viper taking his departure, and Mr. Cushing came on the field in time to see the reptile. These facts prove that the viper does not bite when allowed to have his own way without let or hindrance; but knowing all this, there are very few people with sufficient presence of mind, coolness, and command of nerve, to allow a deadly serpent to crawl over them from foot to head without moving."

Mr. W. T. Blanford, writing of this viper, says, "It is a sluggish animal. A friend once told me he had carried one home under the belief that it was a young

Python, the markings being not much dissimilar; it made no attempt to injure him, and he was only undeceived by one of his dogs being bitten and quickly killed by the snake."

*Family* **Crotalidæ** (Pit-vipers).

*A deep pit in the loreal region.*

*a. The second upper labial forms the front of the loreal 'pit.'*

**TRIMERESURUS**, *Günther*.

**T. GRAMINEUS**, *Shaw*.

Scales keeled, in 19 to 21 rows. Scales of the head smooth or faintly keeled. The supranasals are separated by a small shield or a pair of small shields. Colour grass green, paler on the sides. Belly greenish. A yellow or brick-red line runs from behind the eye along the outer series of scales. Tail sometimes reddish. Grows to 32 inches.

Inhabits Pegu, the Andamans.

**T. ERYTHRUS**, *Cantor*.

Scales keeled, in 21 to 23 rows. Supranasals in contact behind the rostrals, or rarely separated by a small shield. Colour like the last, only lips and chin whitish, and a white lateral line bordered below with greenish or purple. The head is more elongate, oval and depressed than in either the last or the next species. Grows to 33 inches.

Inhabits Pegu, Tenasserim, and Upper Burma.

**T. CARINATUS**, *Gray*.

Scales strongly keeled, in 23 to 25 rows (rarely in 21). The supranasals usually separated by one or two shields, or if not, only just touch, without forming a broad suture. Colour grass green, paler below. Tail rusty. Grows to 37 inches.

Inhabits Pegu and Tenasserim.

These three species are closely allied, and individuals are often not easy to assign without a good series.

**T. PORPHYRACEUS**, *Blyth*.

Scales keeled, in 25 rows. Supranasals small, separated by a large shield. Colour grass green, brown or blackish, either uniform or variously mottled with a fine porphyraceous lustre. Upper lip and below whitish, or occasionally a side streak. Grows to 48 inches.

Inhabits the Andaman and Nicobar Islands.

**T. CANTORI**, *Blyth*.

Scales keeled, in 27 to 29 rows. Colour dull green, with several rows of dark alternating spots. A white lateral line, and another margined with dark green, from the rostral to the gape. Grows to 48 inches.

Inhabits the Andaman and Nicobar Islands.

*b. Shield in front of the loreal pit divided from the second upper labial.*

**T. MUTABILIS**, *Stoliczka*.

Scales keeled, in 21 rows. The second upper labial is sometimes undivided. Colour variable. Olive brown, darker on the head, with numerous greenish dark-edged cross-bands. A white streak from the rostral to gape, meeting a temporal streak, and thence continued along the ventrals. Two other bands down the side, with a dark interspace. Grows to 20 inches.

Inhabits the Andamans and Nicobar Islands.

T. ANDERSON, Theobald.

Scales keeled, in 25 rows. The second upper labial sometimes undivided. Colour rich brown. Belly and sides conspicuously white-spotted, or greenish on sides and belly, spotted and barred with brown. Inhabits the Andamans.

These last seven snakes are essentially tree snakes, and coolies and others engaged in clearing jungle or in gardens are frequently bitten by them. The bite, however, of the Indian *Trimeresura* is not usually (if ever) fatal to an adult, though it occasions pain, swelling, and great local and constitutional disturbance. Dr. Mason remarks: "These snakes may often be seen in trees, and their colouring so much resembles the foliage that I have had my hand drawn back by a native when about to lay it on one, that I was looking for among the branches, but with no intention of touching the reptile. They appear to bite more frequently than any other venomous terrestrial serpents in the provinces; but although the limb that is bitten always swells up to a monstrous size, and much pain ensues, yet I never heard of a case proving fatal. It is a popular idea that snakes have a fascinating power, but I have certainly seen a *Trimeresura* fascinated by a light. It wound itself round a post, and then extended its head towards a candle, at which it gazed steadily for some ten minutes, and when considerable noise was made, it attempted no movement, but allowed the end of a bamboo to be thrust down upon it in front, without making the slightest effort to escape." The following account of the teeth in different poisonous snakes is from the pen of Dr. Nicholson and will be read with interest:

"The simplest form of poison apparatus is that of the sea snakes (*Hydrophidae*), where the addition of a poison gland with duct, and of a canal through the front tooth of the maxilla, is attended with but little of the modification in the shape of the maxilla which is seen in the more highly developed venomous snakes. The *Bungarus* genus (and probably the genus *Callophis*) have the same structure of apparatus as that which will be described of the cobra, but on a smaller scale, and though the maxillary teeth are reduced in number from the shortening of the bone, yet there remain two or three of them behind the poison fang.

"On examining the mouth of the cobra, we find a very marked departure from the arrangement seen in that of a harmless snake. The palatine and mandibular teeth are unchanged, but a considerable modification has taken place in the upper jaw. Instead of a row of teeth, the maxilla shows a single tooth, of which the point is barely visible until a fold of mucous membrane which surrounds it is pulled up. Slit up this gingival fold and the fang will then be exposed; it will be seen to be fixed in very much the same position as a dog's fang, though curving more backwards, and to fit into a depression in the lower lip. Now dissect the skin off the cheek of the cobra, from the nostril in front, to the angle of the mouth behind. A large flask-shaped gland will be exposed on the cheek, extending for half an inch or more behind the eye. It is continued by a duct along the lower edge of the orbit as far forwards as the nostril; a dense fibrous sheath covers the gland and forms a point of attachment to many fibres of the maxillary muscles. Cut through the duct at its beginning just behind the eye, and a canal of very small calibre will be seen in its axis; pass a fine bristle down the canal and by careful manipulation this probe will be seen to go to the end of the maxilla, turn downwards over it, and enter the mouth inside the gingival envelope of the fang, and in front of an orifice in the base of the fang. If we now dissect away the soft parts and reopen the maxilla, we shall see a great modification in its form, compared with the normal type. It barely reaches as far back as the hinder part of the orbit, its shortness being compensated by increased length of the external pterygoid. A short tooth is found at its hinder part, but this is rarely perceptible until dissected down to, and appears to be rudimentary. The rest of the maxilla is flat and occupied on the lower surface by the matrix of the fang; in front, in line with the fore part of the orbit, is the socket for the fang. This part of the bone is thick and wide, and it bears, side by side, depressions for two fangs; one, the inner socket, is generally occupied by the fang in use, the other by the fang in course of growth. The new fang is generally found not yet set and then the outer socket is often open, at other times it is occupied by the newly set fang whilst the inner socket is vacant, and remains so until the new fang has worked

its way inwards. Sometimes these two fangs are found perfect at the same time, then one of them, generally the inner or old fang, will be loose. This occurs at the time of casting the skin, and I have several times removed the old fangs easily with the finger and thumb or a small forceps.

"The fang is slightly curved backwards and inserted at an angle so as to form a hook in the jaw. It is in shape like a short elephant-tusk and does not exceed 28-hundredths of an inch in the longest specimen I have seen. In structure it differs from other teeth in having, when fixed, two orifices communicating with the interior. Instead of a conical hollow, it contains a complete canal. Both orifices are in front, the upper close to and forming part of the base, the lower at a distance from the point equal to about one-tenth of the length of the fang; a groove connects the orifices, or rather did connect them during the growth of the fang, at which time the canal, originally open in its entire length, gradually closed from above downwards. The canal only occupies the front half of the fang; the hinder part is a bony column giving considerable strength to the structure.

"In the *Viperine* snakes a transition takes place, gradually culminating in the most perfect form of poison apparatus, viz. a long fang usually lying supine along the jaw, but capable of erection by a special muscle. The genus *Trimoresurus* is not nearly so complete as this, the fang is long, but there is no special muscle exterior of erection. The maxilla consists of an open shell communicating with the exterior of the cheek. But it is in *Daboia* that we see the perfection of mechanism; on removal of the skin covering the cheek, we come at once across a strong tendon lying below the eye; it arises from the muscles of the cheek and from the fibrous covering of the poison-gland, and is inserted into the maxilla. This bone is found to be considerably modified in form; it is no longer placed below the orbit, this position is occupied by the elongated external pterygoid, whilst the maxilla, only one-fifth of an inch long (in a large *Daboia*) but double that in height, is placed at the end of this bone like a hammer-head at the end of its handle. Imagine the head of a hammer, with the claw downwards representing the fang, hinged at its junction with the handle, and with a string fastened to the head so as to erect at will the claw from its usual supine state; you will then have a pretty accurate idea of the mechanism of a viper's upper jaw.

"In the vipers the fang is much longer than in the cobra and other *Elapide*, but their length has been greatly exaggerated, as it rarely exceeds half an inch in the largest specimens. It is of larger calibre also, and the poison duct is plainly seen to enter the mouth just in front of its superior orifice; the duct winds round a groove in the surface of the maxilla, and a bristle passed along its canal from behind forwards can hardly fail to pass out at the buccal orifice at the bottom of the gingival envelope of the fang. Muscular pressure and spasmodic action of the gland cause an ejection of poison into the fang and through it into the wound. But under ordinary circumstances the poisonous saliva finds its way into the mouth just like the saliva of the other glands running down the inside of the gingival fold along the outer surface of the fang. I have seen the saliva ejected by an enraged cobra in quantities which could not have passed through the fang, for experiments enable me to affirm that a cobra could not inject through the fang with more force than would be necessary to expel one drop (a minim) in three seconds, so fine is the inferior orifice of the fang. A viper could, however, inject the same quantity in half a second, and fluid may be forced through its fang, in a fine stream, while small single droplets can alone be ejected from the cobra's fang."

To kill a snake, Dr. Nicholson recommends placing it in a bottle with some chloroform, the vapour from which soon destroys it painlessly; but this is not always practicable, and can only apply to small snakes, and Dr. Nicholson very justly adds: "Do not commit the cruelty of putting a snake alive into a bottle of spirit, for as long as a bubble of air remains in the bottle the snake can breathe, and the death is a most lingering one." My own plan is as follows. I first catch my snake. This is easily effected by pinning him down with a stick, and seizing him firmly by the nape. I then either divide the spine at the nape with a pair of nail scissors, or a penknife, or make a slit in the cardiac region of the abdomen, and extract the heart with the

finger and thumb. The pulsations of the heart indicate the proper spot to be opened. The snake dies quietly, and it may be presumed painlessly, of exhaustion in from 10 to 20 minutes, and can then be slit up and eviscerated. Coil the body now, belly uppermost, in a proper sized bottle and fill with spirit, rotating the bottle obliquely to get rid of air from between the coils. Previous to coiling, wash the snake in spirits to cleanse it of blood, mucus, etc., and fill up with spirits 20 to 60 over proof. If a large snake, change the spirits in 24 hours, and this spirit will do again for preliminary use in the case of another specimen. All snakes, lizards, bats, and small mammals, should have the abdomen slit up to allow the spirit to penetrate rapidly, but only the large ones need be eviscerated. In the interior of the bottle, in the space within the folds of the snake, lizards, frogs, or other animals may be stowed to economise space; but the spirit must be strong. Brandy or gin is altogether too weak. The stoppers should be smeared with grease, luted down with soft wax and fastened with rag.

*Antidotes to snake poison.*—With the sole exception perhaps of the vexed subject of unfulfilled prophecy, nothing has more fascinated men's minds than the question of snake bite and its antidote, and on no other subject has more utter rubbish and nonsense been written. Poor credulous beings, who hardly know which end of a snake it is which is poisonous, will all the same assure you of the infallibility of some nostrum or other they are in possession of, and the 'evidences' produced in the one case are fully as unconvincing and trumpety as those used to elucidate the other. Herbs and vegetable messes without number, brandy in which the gall bladders of snakes have been steeped, blue stone, acids, alkalis, alcohol, laudanum, cautery, excision, suction, ligature, electricity, and prayer, have all their particular advocates, but the whole results may be summed up in one word—Bosh!

Instantaneously sucking and ligaturing the wound may arrest the effects of the bite of a poisonous snake, but the chances of effectual intervention are small, as the three cases presently quoted will show.<sup>1</sup> Antidotes to the poison there are none, though diffusible stimuli, as ammonia and brandy in moderate doses, may be useful in cases where the results of the bite stop short of death; while all violent measures, compulsory locomotion, heating the patient, and the like are simply pernicious.

### Family Hydrophidæ.

Body strongly compressed posteriorly, and tail paddle-shaped. Loreal none. Venom fang small.

The sea snakes are wholly marine or estuarine, and are incapable of progression on land, viviparous and deadly without exception. They abound on the coast of Burma, but the precise number of species met with has not been ascertained. A brief conspectus of species is therefore here given to facilitate their recognition. The colouration is very similar in the majority of species, being a yellowish ground colour, banded with dark grey or blackish. Their chief difference lies in the proportions, slender or the reverse, of the head, neck and body, and this is difficult to convey without a figure. The colouration too varies with age, being much brighter and the markings more distinct in the young than in aged individuals. The scales too in the young of many species are smooth, which in the adult are keeled or tubercular, so that it requires a large series of a species and its allied forms to satisfactorily determine these snakes.

In Burma vast numbers are caught on the coast in tidal inclosures made for fish, as at Mergui, or in the 'creels' or long baskets which are placed in tidal rivers, as below Bassein at Nga-poo-tan, into which fish, crustacea, snakes and even porpoises (as I am told), are swept by the force of the tide, which 'creels' are visited and emptied at slack water; and these localities are admirable ones for collecting the rich and varied tribute of the sea, of which so much remains yet to be learned.

*PLATURUS, Latreille.*

Shields of head normal, that is, as in colubrine land snakes. Scales imbricate smooth. Tail with two series of subcaudals.

<sup>1</sup> See page 324.

*P. SCUTATUS*, LAUR.

Scales on neck, in 21 to 23 rows. An azygos shield between the posterior frontals. Crown of the head black. Body surrounded by 25 to 50 black rings. Grows to 5 feet.

Bay of Bengal and Eastern seas.

*P. FISCHERI*, JAN.

Scales on neck, in 19 rows. No azygos shield between the posterior frontals. Body surrounded by 33 to 36 black rings. A black band across the occiput and vertical, extending to the lower jaw. Snout yellow. Lower labials black. Length 30 inches.

Bay of Bengal and Eastern seas.

*P. AFFINIS*, ANDERSON.

Resembles *P. Fischeri* in having 19 rows of scales, no azygos shield, and other details. It resembles *P. scutatus* in having 56 black rings and the head wholly black. Length 49 inches.

Tolly's Nullah, Calcutta.

Till more specimens are procured, there seems some doubt if there are three species, or only one rather variable one, of this genus.

## HYDROPHIS.

Head shielded above. One pair of frontals. Nostrils superior in a single shield. Ventral shields narrow, rudimentary or absent.

*A. Scales imbricate.*

*a. Scales in not more than 17 rows round the neck.*

*H. JERDONII*, GRAY.

*b. Scales in 38 to 43 rows round the neck.*

*H. GRANOSA*, ANDERSON.

Habit moderately slender. Scales in 43 rows round the neck. Keels slightly dilated at either extremity. One preocular, one postocular. The ventrals are twice the size of the adjoining scales, and carry either 2 or 4 tubercles. Six anal shields, the outer very large. 52 non-confluent black bands down the body.

This species is nearest to *H. Stokesii*, which it may represent in the Eastern seas.

*H. TUBERCULATA*, ANDERSON.

Scales in 38 rows on the neck, longitudinally bitubercular. One preocular, two postoculars. The fourth and fifth labials below the eye. Scales of the head profusely granulated. Two pairs of large chin shields. Ventrals 321, about twice the size of the adjoining scales, irregular, anteriorly largest, each ventral minutely tubercled at the sides. Four anal shields, the external largest. Body encircled by 59 black bands and the tail by 8, broadest above. Colour above olive yellow, below bright yellow. A dark patch on the crown. A yellow band between the orbits, continued to the neck. A dark streak down the yellow upper labials.

Length 49 inches.

Differs from its nearest ally, *H. granosa*, by its reduced number of scales, two postoculars, chin shields, etc.

Tidal branches of the Hugli.

*c. Scales in 23 to 38 rows round the neck. Head not very small.*

*Neck moderately or not slender.*

\* *One postocular.*

*H. MAJOR*, SHAW.

Belly with only a few ventral shields. Scales keeled, 31 rows on neck. Four

large anal shields. One labial below the orbit. 31 large rhombic black spots on the back posteriorly, which do not descend to the middle of the sides.

*H. robusta*, Günther.

Scales tubercular, 31 rows on neck. Two or three labials below the orbit. Ventrals broad, 310. Trunk with 35 narrow distant black rings, extending round the belly, but sometimes interrupted on the sides and dilated on the back.

*H. cereulescens*, Shaw.

Scales strongly keeled, 37 rows on neck. One labial shield below the orbit. Ventrals bituberculate, 300, and not much larger than the adjoining scales. Yellowish, with 37 to 46 rhombic blackish spots on the back, broadest on the vertebral line, and not descending to the middle of the side, or they may be continued to the belly as faint greyish cross-bands.

*H. spiralis*, Shaw.

Scales tubercular, 31 rows on neck. Third and fourth labials enter the orbit. Ventrals 320, twice or thrice as large as the adjoining scales. Trunk surrounded by 42 to 48 black rings, scarcely broader on the back, and half as wide as the interspaces. A series of vertebral black spots posteriorly. Head black above, with a yellow horse-shoe mark. Belly black. Tail black posteriorly.

*H. melanostoma*, Günther.

Head rather small. Scales strongly keeled, 27 rows on neck. Two labials enter the orbit. Ventrals 335, twice as large as the adjoining scales and posteriorly bicarinate. The yellow ground above only shows as narrow vertical stripes on the sides. Black rings 60. Head blackish.

*H. torquata*, Günther.

Head small, neck slender. Scales keeled, 35 rows on neck. The fourth labial under the orbit. Ventrals 284, bicarinate, and twice as large as the adjoining scales. Trunk with 50 to 52 blackish-olive cross-bands, broadest above, and very faint on the belly. Snout black, with a yellow band behind. Lower jaw and throat blackish, belly white.

\*\* *Two postoculars.*

*H. belcheri*, Gray.

Scales keeled, 25 rows on the neck. The fourth labial under the orbit. Ventrals simple, 317, more than twice as broad as the adjoining scales. Back brownish-olive, sides and belly yellowish. The back dark-barred anteriorly, with yellowish interspaces. Head and throat blackish, with yellow horse-shoe on the crown.

*H. aspera*, Gray.

Scales strongly keeled, 30 rows on the neck. Two labials below the orbit. Ventrals 340, twice as large as the adjoining scales, and each with several minute tubercles on each side. Dirty yellowish. Back with 47 black rhombic tangential cross-bands, faint on the sides. Crown blackish.

*H. cyanocincta*, Daud.

Scales faintly keeled, 31 rows on the neck. Two labials below the orbit. Ventrals 320 to 426, twice as large as the adjoining scales and bitubercular. Greenish olive on the back, yellowish on the sides and belly. Trunk with 50 to 75 black cross-bands, broader than the interspaces, and sometimes fading on the sides. Very common, and grows to more than 6 feet.

- *H. subcincta*, Gray.

Head rather small and narrow. Scales keeled, 23 rows on the neck. The fourth labial under the orbit. Ventrals 342, not twice as large as the ordinary scales, bitubercular, and posteriorly divided. Trunk with 41 dark cross-bands, as broad as the interspaces, and not reaching to the middle of the sides. A row of spots along lower part of the side.



**H. NIGROCINCTA**, Daud.

Head small. Scales keeled, 29 rows on the neck. The fourth labial under the orbit. Ventrals 320 to 331, not twice as large as the adjoining scales, and smooth. Trunk surrounded by 53 black rings, narrower than the interspaces, 3 and 5 scales broad respectively. Colour greenish olive, yellowish on the sides. Tail with 9 to 11 black bars.

*d. Head very small. Neck very slender.*

*\* One postocular. The third upper labial not in contact with the nasal.*

**H. CULOTIS**, Daud.

Scales tubercular and faintly keeled, 31 rows on the neck. Ventrals 473 to 500, not much larger than the adjoining scales. Greenish-olive above, yellowish on the sides. From 59 to 67 rhombic bands on the back, which are narrower and fainter on the sides, but extend round the belly, where the yellowish ground colour sometimes is reduced to a pair of spots.

**H. LINDSAYI**, Gray.

Hardly separable from the last, but is said to have a shorter neck and fewer bands.

**H. LATIFASCIATA**, Günther.

Head small. Scales keeled, 23 rows round the neck. The third labial not in contact with the nasal. Ventrals 322, distinct. The anterior twice as broad as the scales, the posterior bicarinate. Terminal scale of tail very large. Trunk with 38 broad black cross-bands, confluent above and below, and darker below. The yellow colour only shows as large rounded lateral spots.

Mergui.

**H. CORONATA**, Günther.

Head very small. Scales keeled on the back, tubercular on the sides. Ventrals 321 to 337, bitubercular, nearly twice as large as the adjoining scales. Trunk with 53 to 59 complete black rings, broader than the interspaces, which are yellowish-olive. Head and under the neck black. A yellow horse-shoe on the head. Tail with 11 blackish bars.

*\*\* Two postoculars. The third upper labial not in contact with the nasal.*

**H. ATRICEPS**, Günther.

Head small. Scales, with a small apical tubercle, 26 to 28 rows on the neck. Ventrals 376, anteriorly twice as large as the adjoining scales, posteriorly smaller, bitubercular. Back with 62 blackish-olive cross-bands, tangential on the vertebral line. Sides yellowish white. Head black.

**H. DIADEMA**, Günther.

Head very small. Scales tubercular, 33 rows on the neck. Ventrals 318, only on the neck twice as large as the adjoining scales. Trunk with 63 blackish rings broader than the interspace, and narrower and paler on the belly. Head blackish, with two yellow converging superciliary bands. Tail 7 to 9 blackish cross-bars.

*B. Scales not imbricate, placed side by side.*

*a. Head very small, and neck very slender.*

*\* One postocular.*

**H. GRACILIS**, Shaw.

The third upper labial not in contact with the nasal. Scales tubercular, 21 rows on the neck. Ventrals 230 to 290, anteriorly twice as large as the adjoining scales, posteriorly smaller, and divided. Trunk anteriorly surrounded by blackish rings. Behind greenish-olive, whitish below. Throat and crown of head blackish.

*H. fasciata*, Schn.

The third upper labial not in contact with the nasal. Scales tubercular, 25 rows on the neck. Ventrals bitubercular, 316, and twice as large as the adjoining scales, and undivided to the vent. Six small anal shields. Trunk with 13 deep black rings, nearly twice as broad as the yellow interspaces, and confluent on the belly. Head black, with yellow dots behind the eye. Tail black, with 3 basal yellow bars.

*H. Cantoris*, Günther.

The third upper labial in contact with the nasal. Scales tubercular (smooth in young), 23 rows on the neck. Ventrals 412 to 440, anteriorly twice as large as the adjoining scales, posteriorly divided. Some 30 blackish rings on the slender part of the body, confluent above and below, the yellowish-green ground showing as rounded spots or interspaces. Posteriorly uniform olive, with yellowish sides. Two blackish bands on the tail.

b. *Head moderate. Neck moderately elongated.*

\* *One postocular.*

*H. stricticollis*, Günther.

Scales smooth (in the young type). 34 rows round the neck. Ventrals 398, only anteriorly twice as broad as the adjoining scales. 56 blackish rings on the body, not quite so broad as the yellowish interspaces. Head yellow above, with darkish confluent spots.

*H. curta*, Shaw.

Head short, thick, obtuse. Body stout throughout. The occipital shields always divided. Scales in 30 to 34 rows round the neck. Ventrals nearly twice as broad as the adjoining scales and 156 to 160. 50 to 53 blackish bands across the back, equal to the interspaces, and not usually descending to the belly. A yellow temple streak. Tail black, with basal yellow spots. The type was from Madras.

*H. Hardwickii*, Gray.

Habit as in *H. curta*. Scale tubercular, in 29 to 33 rows on the neck. No distinct ventrals. 4 to 6 small preanal shields. A long central spine to each scale of the 8 ventral rows. 41 to 43 broad blackish bands across the back, descending to the middle of the sides. Beneath yellowish. Tail black, with 3 to 5 yellowish bands.

*H. FAYRERIANA*, Anderson.

Habit as in *H. curta*. Body nearly equal throughout, but narrower for its anterior fifth. Scales smooth, in 34 rows on the neck. No enlarged ventrals, but 193 scales from vent to chin. Five pairs of preanal shields. 39 broad olive-brown bands across the back, not descending to the belly, separated by pale interspaces half a scale broad.

Body 30·2; tail 3·1=33·3 inches.

Puree.

Distinguished from *H. Hardwickii* by its smooth scales, and by the partial imbrication and greater number of the ventral scales.

*H. Loreata*, Gray.

Habit as in *H. curta*. Scales tubercular, 27 to 31 round the neck. No distinct ventrals, but the three or four lower lateral rows are enlarged. 29 to 34 black rings round the body, tapering on the sides and belly. Head yellow, banded across the frontals. Tail with 6 white bands across its upper and basal half.

\*\* *Two postoculars.*

*H. LAPEMOIDES*, Gray.

Head narrow, neck elongate. Scales keeled, 30 to 32 rows on the neck. Ventrals 350, twice as broad as the adjoining scales. Trunk with from 37 to 43

black rings dilated on the back and belly, and equal to the interspaces. Head black, with two lateral yellow bands converging on the nasals. Tail black, with a basal white ring, and some half rings across the back.

*H. LONGICEPS*, Günther.

Head elongate, body slender. Scales keeled, 30 rows round the neck. Ventrals 271, twice as broad as the adjoining scales. Back barred by 53 broad blackish-olive bands, which do not reach the middle of the sides, the interspaces one-third as broad as the bands. Sides and belly uniform whitish. Tail with 11 vertical bars.

*H. ORNATA*, Gray.

Snout elongate, body rather elongated anteriorly. Scales tubercular, 35 rows round the neck. Ventrals 252 to 260, twice as broad as the adjoining scales. Colouration as in *H. longiceps*, but the interspaces are narrower. A wedge-shaped spot, point upwards, separates the end of the cross-bands, and a vertical bar below each band. Head blackish-olive, with white superciliary ridge. Tail black, with narrow whitish cross-bars.

*H. ELLIOTTI*, Günther.

General aspect as in *H. ornata*, but as many as 300 ventrals, and with white stripes between the bands. Head greenish-olive. Tail with yellowish cross-bars.

*H. PACHYCEPHALUS*.

The third upper labial enters the orbit, and is not in contact with the nasal. Scales tubercularly keeled, 28 rows on the neck. Ventrals 258, and more than twice as broad as the adjoining scales. Body brownish-yellow above, indistinctly banded. Belly and sides white. Tail black behind.

*H. CRASSICOLLIS*, Anderson.

Neck and body of nearly equal girth. Scales almost smooth, in 31 rows round the neck. Scales feebly bitubercular posteriorly. Ventrals twice the size of the adjoining scales, and smooth. Two pairs of preanal shields, the outer very large. Colour olive-yellow above, yellowish below. 62 broad black bands across the back, coming to a point on the sides, and indistinctly produced below, where they expand into a large blackish spot. Tail with six black rings and its terminal third black.

Body 49.3; tail 4.3=53.6 inches.

Hugli River.

*H. VIPERINA*, Schmidt.

Head and body moderate. The third upper labial does not enter the orbit. Scales keeled, 29 rows round the neck. Ventrals 237, anteriorly six times as broad as the adjoining scales, diminishing to the breadth of a single scale towards the vent. 31 to 38 rhombic black spots along the back, sometimes confluent in front.

*H. ANOMALA*, Schmidt.

Head short, thick, obtuse; body stout. Scales hexagonal, with a strong white keel. Ventrals bicarinate, and as large as the adjoining scales. Trunk with 26 or 27 large rhombic bluish-grey transverse spots.

*ENHYDRINA*, Gray.

Differs from *Hydrophis* only in having a deep longitudinal notch in front of the lower jaw. Rostral shield very small; lobuliform, its point fitting into a cavity in the lower jaw.

*E. BALAKADYEN*, Boie.

*E. Bengalensis*, Gray.

Head short, and all its shields granular. Scales hexagonal or suboval, carinated in the centre, and contiguous rather than imbricate, in 38 to 44 rows round the neck. Back with rhombic bands, which disappear with age.

*E. schistosus*, Daud.

*Hoggli puttee*, Russell.

Form more slender than in *E. balakadyen*. Scales on the neck elongated, pointed, imbricate, in 56 to 60 rows. Head more ovately prolonged, and the gape wider than in the last species; and consequently the head shields are more elongate and are all smooth. Colouration as in the last.

The two species of *Enhydryna* are very similar, and *E. schistosus* would seem to be comparatively rare. Russell was the first to point out the distinction, which was subsequently confirmed by Stoliczka (J.A.S.B. 1870, p. 213) and Anderson (P.Z.S.L. 1871, p. 193).

*E. balakadyen* abounds in tidal waters and estuaries in Burma, and is frequently taken in fishermen's nets.

*PELAMIS*, *Günther*.

Head flat, with long spatulate snout. Nasal shields contiguous, pierced posteriorly. Ventrals none, or very narrow. Lower jaw without a notch in front.

*P. PLATURUS*, L.

Scales impressed or concave, on the neck, in 45 to 51 rows. Scales from mouth to vent 378 to 410, the lower rows sometimes spiny or tubercular in adults. Colour variable, above black, below olive or yellow; colours sharply defined and separated by a yellow band, and sometimes with an inferior black band as well. Brown spots sometimes on the sides, and tail reticulated black and yellow. It also occurs yellow, with black-edged brown bars across the back, the interspaces on the belly being marked with vertical dark streaks. Grows to 3 feet.

Andamans and Nicobars, and Eastern seas generally.

There are few subjects, respecting which more profound ignorance prevails, than the means of determining whether a snake is poisonous or not; for the question is eminently a special one, though neither difficult nor obscure when once the few facts and rules are mastered, which are necessary for the purpose. With the exception of a few well-known and justly-dreaded snakes, like the *Cobra*, the *banded Bungarus*, the *blue Bungarus*, or *krait*, or the *Russell's viper*, no native testimony in regard to the poisonous or nonpoisonous character of a snake can be relied on, as natives generally attribute poisonous powers to all snakes with which they are unfamiliar, or which have bright colours, or a repugnant physiognomy, and are as wholly guiltless of any accurate knowledge of the subject as the bulk of Europeans.

Practically, as regards poisonous snakes which are dangerous to man, the question is narrowed to the consideration of a limited number of species, since many from their small size, and others from their rarity, may be disregarded, and hence, perhaps, the simplest way of learning what are poisonous snakes would be to pass an hour or so in some museum where acquaintance might be made with the commoner or more deadly species. The snakes I should characterize under this head would be, 1stly, the Hydrophidæ, or marine snakes, possessing a flattened tail, the whole of which are very deadly without exception, their fangs being small, but their venom extremely potent. 2ndly, the vipers possessing tubular erectile fangs of great length. The venom of some of these is very deadly, as in the *Daboia*, or *Russell's viper*, and the Javanese *Calloselasma*, whose bite is said to be fatal to man in five minutes, which is far quicker than that of the *Cobra*, whilst others, such as the *green vipers*, seem to be less dangerous, recovery generally taking place from their bite, with merely local pain and some constitutional disturbance. 3rdly, the ordinary poisonous snakes, such as the gigantic *Hamadryas*, the *Cobra*, the *blue Bungarus*, or *krait*, the *black and yellow banded Bungarus*, and some of the larger species of *Collophis*.

There are only two harmless snakes which, from their peculiar colouration and from their also inhabiting estuaries and coasts, can be mistaken for any of the poisonous family of Hydrophidæ. The one, *Hipistes hydrinus*, has, however, a loreal shield, which at once shows its innoxious character, whilst the other, *Chersydrus granulatus*, may be easily discriminated by possessing over 100 rows of scales.

The poisonous viperine snakes are easily distinguished by their long tubular and erectile fangs, by their triangular head, keeled scales, and repulsive physiognomy, their short tails, stout form, and in the majority of Indian species by a *præorbital pit*, whence the name of one section of them of pit-vipers, the most celebrated of which is the American rattle-snake. Among the ordinary venomous or colubrine snakes, the *Hamadryas* is undoubtedly the most formidable, whilst commoner than any are the *Cobra*, the *blue* and the *banded Bungarus*, the bulk of the other Elapidae being too small or too rare to merit particular notice.

To determine a snake it is necessary first to become familiar with the shields which cover the head. The nostril of a snake is either situated between two shields or pierced in one. These shields are the *nasals*, anterior or posterior. The eye is bounded on either side by one or more shields called respectively the *præ-* and *post-oculars*. The shield which is interposed between the *nasals* and *oculars* is the '*loreal*,' and there may be several or none. The other shields of the head are the '*rostral*' in front, followed by one or two pair of '*frontals*,' then a '*vertical*' occupying the crown of the head, and two occipitals behind the vertical. Over the eye is the '*superciliary*,' and along the jaws the upper and lower '*labials*' respectively. Below the chin are the '*mental*' or '*chin shields*.' The shields of the belly are the '*ventrals*,' and below the tail the '*subcaudals*,' which may be either entire or divided.

On a snake being brought in, the first point to ascertain is, whether or no it has a loreal shield, *for the rule is absolute, and without exception, that every snake possessing a loreal shield is harmless.* If no loreal shield is present, a very brief inspection will show if it belongs to the Hydrophidae with a flattened tail; or to the Crotalidae or Viperidae with erectile tubular fangs and rough scales, and if to neither of these groups, it still remains to determine whether it belongs to one of the innocuous species which possess no loreal or to a poisonous species, *none* of which possess it. The poisonous Elapidae are all characterized by a small eye with a round pupil, and by the presence of a venom fang, grooved in front, and terminating in a slit. There are only four genera, and if the snake under consideration belongs to none of these, it is harmless, though no loreal is present. The four genera of poisonous colubrine snakes are: *Naja*, with 15 rows of scales round the body; *Xenureclaps* and *Bungarus*, with 15 rows also, but the vertebrals are enlarged; and *Callophis*, with 13 rows only.

The number of poisonous snakes is therefore practically very few, but a great many harmless snakes are equally unprovided with a loreal shield, of which a list is here appended for convenience of reference.

The snake is harmless though the loreal shield be absent—

<i>If the scales are smooth and the nostril in an undivided shield—</i>	Cylindrophis.
<i>If there are five occipitals—</i>	Xenopeltis.
<i>If the tail is truncated—</i>	Fam. Uropeltidae.
<i>If there are less than 6 upper labials—</i>	Calamaria.
<i>If there are 8 upper labials—</i>	Macrocalamus.
<i>If the nostril is in a single shield—</i>	Blythea.
	Cyclophis.
	Odontomus.
	Paras.
	Ulupe.
<i>If the præocular is elongate and the body stout—</i>	Geophis.
<i>If there is but a single præfrontal—</i>	Aspidura.
	Oligodon brevicauda. Fordonia.
<i>If the third upper labial of six forms the lower rim of the orbit—</i>	Oligodon modestus.
<i>If the scales exceed 15 rows—</i>	Gonyosoma frenatum. Tetragonosoma.
<i>If the tail is flattened and the scales exceed 100 rows—</i>	Chersydrus.
<i>If the pupil is horizontal—</i>	Tropidococcyx. Passerita.

As regards the treatment to be pursued in cases of snake-bite, it would seem as though the only remedy of the slightest value in the case of the effective bite of

a venomous snake is a ligature applied within a few seconds of receiving the injury, and either suction or excision of the wounds. If the poison once gains an entry into the system, it is next to useless drenching the unfortunate patient, as is too often done, with either such antidotes as ammonia, ardent spirits or any so-called specifics, or torturing him with the actual cautery of live coals, gunpowder, etc., or bounding the poor man about till he dies to prevent his sinking into sleep. If the patient does not object to it, a glass or two of brandy and water might be given, as cases sometimes occur where nothing more than fear is the cause of very alarming prostration, and in such cases a stimulant would do good; as where a man has been bitten by a harmless snake, which he believes to be a Cobra. I once heard of a man who, walking in the dark, trod on one end of a thin coil of tin plate, the other end of which flying up, slightly punctured one of his calves. The impression on the man was, that he had been bitten by a large snake, and an alarming state of prostration supervened, which however was cured by some one going out and finding the cause of the mischief. It cannot, therefore, be too widely known that in the case of snake bite, the sufferer's life is in his own hands, as nothing but instantly sucking the wound, with or without ligaturing it, can prove of the slightest value, all recoveries from snake bite, under treatment, being cases which would probably have recovered no less speedily without it. I cannot resist here extracting the philosophic remarks of Dr. Fayer on the prevalent mode of worrying to death the unfortunate victim of snake-bite. "But another popular mode of treatment of the so-called lethargy induced by the poison, that by walking the person violently about and keeping him awake by flogging, pinching and other such violent measures, is in my opinion of very doubtful efficacy, if not altogether wrong. *The man who is dying from snake bite is perishing from rapid exhaustion of nerve force.* To make him take violent exercise and deprive him of rest seems to me more likely to do harm than good. It would be almost as reasonable to give a man a blow on the head to recover him from concussion of the brain, or to give him antimony to cure him of sea-sickness. Let him lie down. Leave him to rest, to sleep if he can."

Speaking of chemical antidotes, Dr. Fayer thus expresses himself: "I have no hesitation in saying that I believe them to be useless, and that, excepting for their stimulant action when they have any, they are inert. When the symptoms of poisoning have set in, either when the ligature and excision or caustic or cautery have failed, or when they have not been used, I believe that the only rational treatment is to endeavour to rouse the sinking energies and arrest the tendency to fatal paralysis of the nerve force, by the aid of alcohol or other stimulants such as ammonia or ether judiciously administered, avoiding anything that can depress, such as over-exertion or fatigue, especially that produced by the popular practice of making the sufferer walk when his force is almost expended. Brandy or whisky or indeed any form of alcohol should be given freely and frequently, though not in the large quantities sometimes recommended. My belief is, that if a certain quantity of the poison has entered the circulation, we can expect but little benefit from treatment of any kind; where less has entered, yet enough to cause dangerous present and consecutive symptoms, we may do much to support the strength and save life by ordinary rational measures. But that we possess any drug or substance, solid or fluid, that either swallowed or inoculated can counteract or neutralize the poison once absorbed, and acting on the nerve centres, I do not believe,—and I think the notion that we do is a dangerous one, and liable to do harm by inspiring confidence in ways and means, in which none should be placed."—*Thanatophidia*, pp. 38, 39.

To show how small is the chance of recovery from an effective bite of a venomous snake in possession of its full powers, I will quote three experiments from Dr. Fayer's work, together with the reflection suggested by them.

"June 26, 1869. *Experiment No. 15.*—A pariah dog was bitten in the fore arm by a cobra (Kala Keantiah) at 3·2 p.m. A ligature had been thrown round the limb above the bitten part, which was immediately tightened. A pointed steel, heated to a red heat, was then, at 3·3 p.m., inserted into the punctures, and the wounds were thoroughly cauterised." Forty drops of liquor ammonia, in three parts water, were injected into the jugular vein, but the dog died in 43 minutes.

*Experiment No. 16.*—A dog was bitten by a fresh cobra (Kala Keantiah) in the fore arm at 3:38 p.m. A ligature was immediately tightened round the limb above the wound. The actual cautery was at once applied, until the fang wounds and the adjacent parts were completely disorganized. The dog died without further treatment in 35 minutes. On this case Dr. Fayer remarks, "In this case, notwithstanding the ligature, which was applied as tightly as two persons could pull it round the leg, and the deep and thorough actual cauterization, immediately after the bite, the snake poison found entry into the system and proved fatal in 35 minutes. Nothing, it seems to me, can more strongly demonstrate the extremely subtle and virulent nature of the cobra poison, than these experiments. Nothing, I think, is more significant of the improbability of anything proving to be an antidote. If the poison find entry into the blood-vessels, and be carried to the nerve centres, I am inclined to believe that nothing can prove of any avail, excepting in those cases when the bite is imperfect, the quantity or the quality of the poison diminished or deteriorated, or the snake itself is young, weak, exhausted, or is one of a less poisonous family; such, I believe, are the only cases in which recovery occurs, through the inherent vigour of the animal or person bitten, perhaps aided by stimulants and excitement."—(Fayer's *Thanatophidia*, p. 97.) Still more instructive is the third case. "A very large and vigorous pariah dog was bitten in the marginal fold of integument between the thigh and the abdomen, by a cobra, at 3:55 p.m. The part was immediately cut out by a bistoury, the places where the fangs had penetrated being completely removed. The instrument was at hand and the operation was done at once. Two seconds, not more, might have intervened between the bite and the excision. At 4 p.m. some brandy was poured down the dog's throat; 4:6 another dose of brandy administered; 4:16 he is excited, and respiration hurried, perhaps from the brandy; 4:25 the dog is not yet affected by the poison; 4:33 much the same, the breathing rather hurried; 4:42 no symptoms of poisoning, except the hurried breathing, and that may be from excitement; 4:47 more brandy given; 4:50 no symptoms of poisoning yet; 5:10 vomited, shows symptoms of being poisoned; 5:15 vomited again; 5:30 restless, breathing hurried, abundant flow of saliva; 6 p.m. slight convulsions, breathing hurried; 6:30 dead. Bitten at 3:55, dead at 6:30, in 2 hours and 35 minutes. Here again the extraordinary virulence of the poison is shown. The snake bit in a fold of skin, which was immediately excised, yet in the slight interval—it could not have been more than two seconds—enough of the poison had entered the circulation to cause death in 2 hours and 35 minutes, notwithstanding the free administration of brandy. The dog too, was an unusually large and vigorous animal."—Fayer's *Thanatophidia*, p. 105.

Again on the critical question, the possibility of arresting the poison after an effective bite, Dr. Fayer remarks—"That such *may* be done, I will not deny, but the two experiments just recorded, performed with the greatest care and speed by two surgeons accustomed to such operations, show that at the least it is very difficult. The moment of time that intervenes between the injection of the snake poison by the powerful maxillary muscles through the tube-like fang into the minute blood vessels of the part, and the application of the ligature and actual cautery, is sufficient to allow of the entry of the poison within the circulation, and this reaching the nerve centres, even in a small quantity, may prove fatal."

For further details of this most interesting subject, reference must be made to Dr. Fayer's work, but I will record the chief deductions from the experiments made and other data therein brought together and reviewed.

1. Snake poison is not only active when injected into the system, but develops its poisonous action when applied to a mucous surface, or the conjunctiva.
2. The blood of an animal killed by snake poison is itself a powerful poison when introduced into the system of another animal.
3. The milk of a woman bitten by a poisonous snake is fatal to the child, if allowed the breast.
4. The poison of the colubrine snakes does not interfere with the coagulation of the blood after death in the lower animals, but the blood remains fluid (as a rule) after death from the bite of a viperine snake. Authentic particulars on the state of the blood of the human subject after colubrine poisoning are still wanted.

5. Symptoms of poisoning after an effective bite are visible after the lapse of a few seconds only, and should the poison have penetrated a large vessel, death may result within the minute, though such a case is of course rare.

6. The bite of a poisonous snake seems to exercise no influence on another poisonous snake, *of the same family*, or on itself, but is fatal, though slowly, to a harmless snake.

7. The most deadly poison seems to be that secreted by the two *Najas* and Russell's viper, and scarcely less potent is that of the *Echis*, the *Bungari*, and *Hydrophidæ*. The poison of the Indian *Crotalidæ*, however, though certainly occasionally fatal, is not perhaps usually so, and there is always fair presumption of recovery from the bite of our green vipers (*Trimeresurus*).

8. Specific remedies or antidotes for snake-poisoning there are none. Where the bite has been, from any cause, only partially effective, diffusible stimulants, as ammonia and alcoholic mixtures, may be resorted to with benefit, to aid the flagging powers of life.

9. Cases have often occurred of men bitten by harmless snakes exhibiting symptoms of most alarming prostration, and being reduced to a moribund condition through fear only, so that every endeavour should be made to secure the snake, as its recognition as a harmless species is all that is wanted in such case to effect cure.

In the Madras Monthly Journal of Medical Science for November, 1870, Dr. E. Nicholson has a paper on some popular errors regarding Indian snakes. Dr. Nicholson's views on the true reason of the immunity of some snake-catchers from serious results from snake bite, are very curious, and deserving of full investigation, as he sees reason to attribute it to a continuous system of inoculation with snake venom, the result of which is that the elder men among the Burmese snake-charmers possess greater powers of withstanding snake poison, than the younger, owing to the more perfect protection enjoyed by them from inoculation persevered in through many years. I doubt the fact myself, but it is certainly a curious assertion, to emanate, without good reason, from an Assistant Surgeon who for years has made these animals his companions, as well as subjects for study.

#### Order SAURIA.

Scaled reptiles, usually possessing eyelids and limbs, both never absent. The rami of the mandible united by a bony symphysis, and incapable therefore of dilatation like the jaws of snakes. Teeth adnate to the jaws, not in sockets. Vent linear, transverse. Tongue single or double. Reproductive organs double.

#### Family **Varanidæ.**

*VARANUS, Merrem.*

Nostrils in an oblique slit between the eye and snout. Scales elliptic, subantegential. Tail compressed vertically. 5 claws on all feet.

*V. NEBULOSUS, Gray.*

Nostril nearer the eye than the nose. Scales of neck and back obtusely keeled. Superciliary scales enlarged.

*V. DRACENA, L.*

Nostril midway between eye and nose. Scales smooth. Superciliary scales small.

*V. FLAVESCENS, Gray.*

Nostril nearer the nose than the eye. Scales strongly keeled. Superciliary scales unequal.

All these species occur in Burma, and attain to about fifty inches. The tail is vertically compressed in all.

*HYDROSAURUS, Wagler.*

Nostrils rounded, near the end of the snout.



## H. SALVATOR, Laur.

Nostrils anteriorly placed. Colour of adult blackish, with four transverse bands of yellow ocelli across the back. Grows to about seven feet in length.

All these lizards are highly esteemed for food, and are sought for in hollow trees by the aid of dogs. If not wanted at once, the wretched creature has its fore feet bent over its back, a few of its toes are broken, and the sinews drawn out and tied in a knot, so rendering the animal helpless. Dr. Mason observes:—"The Karens, who are extravagantly fond of their flesh, steal up the tree with a noose at the end of a bamboo, and often noose them while leaping for the water, or catch them in a boat which is brought under the tree. The head, the natives say, is venomous, and they discard it altogether; but the flesh of the other parts, which smells most odiously, is deemed by the Karens much preferable to fowls." The eggs of these animals are also highly esteemed for food, and eagerly sought for.

*Family Lacertidæ.*

TACHYDROMUS, *Daudin.*

Nostril in a single shield above the labials.

T. SEALINEATUS, *Daud.*

Dorsal scales in four longitudinal rows, strongly keeled. Grows to fourteen inches, of which the tail is five-sixths.

Inhabits Arakan, Pegu and Tenasserim. An elegant and agile species.

*Family Zonuridæ.*

Scales large, squarish. A longitudinal fold along the sides.

PSEUDORUS, *Merrem.*

P. GRACILIS, *Gray.*

Body and tail of nearly uniform bulk (the term *gracilis* is a complete misnomer). Vent placed about the middle. A distinct longitudinal fold, and a pair of rudimentary hind legs only. Colour yellowish-brown, and during life a number of irregular shining turquoise blue spots. This rare lizard has been obtained near Rangoon.

Anderson obtained this species in the Sanda valley in Yunnan, and, like the Khasi Hill specimen, these had 16 longitudinal rows of scales, and 10 ventral rows, whereas the Rangoon lizard had only 14 and 8 respectively. The head shields and colouration are rather variable.

*Family Scincidæ.*

Ground lizards of active habits. No femoral or inguinal pores. Tail very fragile.

Section A. *Keeled scales.*

TROPIDOPHORUS, *Dumeril et Bibron.*

Scales strongly keeled, or exceptionally smooth. Tail spinate. Nostril in a single small shield.

T. BERDMOREI, *Blyth.*

The keeled scales of the back form parallel ridges. Colour pale olive brown, with oblique transverse red bars, margined with black. Grows to a little over seven inches. Scales dull.

Ranges from Tenasserim through Pegu to Yunnan.

The specimens of this lizard procured by Dr. Anderson in Yunnan are smooth, and not keeled as is the case with all hitherto captured in Tenasserim or Pegu; but

the resemblance in other respects of these smooth lizards is so complete that they can only be regarded as a local race, and not a distinct species.

This lizard differs from all others of the same family in its habit of readily entering water. The specimens captured by myself in Tenasserim were taken beneath stones and amongst the gravel of a stream bed, in which the water was close to the surface, and into which water the lizards readily entered when endeavouring to escape from pursuit, beneath the submerged stones, which seemed to be their habitual sheltering place.

*ECHEPES, Wagler.*

Each scale of back with several keels. Tail rounded.

*a. Lower eyelid scaly.*

*E. CARINATUS*, Schneid.

Scales 3 or 5, keeled. Colour rich olive brown or bronze, with a pale lateral stripe. Often black dotted. Belly yellow or silvery. Seasonably bright red. Viviparous.

Common throughout Burma. Grows to twenty inches in the Andamans, but is not usually found elsewhere more than twelve, of which the tail is more than half.

*E. MACULATUS*, Blyth.

Scales 5 or 7, keeled. A smaller and more slender species than the last. Does not exceed seven and a half inches. Oviparous.

*E. NOVE-CARINATUS*, Anderson.

Scales 9, keeled. Grows to seven inches.

Inhabits Upper Burma.

*E. REGIFERA*, Stoll.

Fore limbs feeble, reaching to the front edge of the eye. Nostril large. Two loreals and five occipitals. Scales on the back strongly 5-keeled. 8 rows on the belly, smooth. Dark brown, paler on the head. Two side streaks anteriorly. Belly yellowish, with a greenish tinge.

Inhabits Kamorta.

*E. OLIVACEUS*, Gray.

Scales with 3 or more slight keels. Colour brown. About 12 black transverse streaks, each black scale with a white spot. Below greenish olive. Tail scarlet (below?).

Inhabits the Nicobars and the Malayan Peninsula.

Section B. *Scales smooth.*

*HIJULIA*, Gray.

Supranasal none. Lower eyelid scaly.

*H. INDICA*, Gray.

Colour bronze brown. Sides dark-banded, below white. Scales between fore and hind limb in forty-six rows. Grows to ten inches. Burma.

*H. MACULATA*.

Colour pale bronze brown, with ten series of black dots. Sides dark-banded, below white. Scales between fore and hind limbs in ninety-six rows. Grows to over seven inches.

Pegu, Martaban, the Andamans.

*MOCOA*, Gray.

Supranasals none. Lower eyelid with a transparent disk.

M. EXIGUA, Andamans.

Ear without lobules. Four superciliaries. A pair of anterior occipitals, the azygos shield behind them rather large. 28 rows of scales round the body. 15 between the axilla and groin. Limbs feeble. The fore legs reach to the eye, the hind legs to half way to the axilla. A dark brown band from the snout to the tail. A pale greenish yellow band from the eye to the tail, and a broad brown band through the eye and ear to a little beyond the hind limbs. Below pale yellowish-brown. Tail olive, with a dorsal and lateral series of minute black dots. Limbs spotted brown and olive.

Inhabits Momiën.

RIOXA, Gray.

Body long. Limbs feeble.

a. *Lower eyelid scaly.*

R. ALBOPUNCTATA, Gray.

Lower eyelid scaly. Tail large and cylindrical. Limbs feeble, giving the lizard a snake-like look. Tail shorter than body. Colour brown, with six fine black lines down the back and tail. Sides white-spotted. Grows to four and a half inches.

R. LINEOLATA, Stöl.

Like *R. albopunctata*, but the tail is longer than the body. The centres of all the dorsal and lateral scales are pale, giving rise to pale longitudinal lines. Length three and a half inches. Inhabits Martaban.

b. *Lower eyelid with a transparent disk.*

R. ANGUINA, Theobald.

Lower eyelid with a transparent disk. Five occipital shields, the central one being nearly as large as an anterior one. Colour brown above, white below. No stripes or dots. Length four inches.

Inhabits Pegu.

R. CYANELLA, Stöl.

Like *R. anguina*, but the central occipital shield small. Colour brownish olive, with a few white spots on the neck and behind the shoulder. Size and habitat same as the last.

DIBAMUS, *Dumeril et Bibron.*

Limbs in male 2, lodged in an oblique cavity. Females limbless.

D. NICOBARICUS, Fitzinger.

24 rows of scales round the body. Colour dark brown, paler below. Grows to 6 inches, and inhabits the Nicobars.

### Family Geckotidæ.

Toes adapted for pneumatic adhesion.

a. *Adhesive plates of feet undivided.*

GECKO, *Daudin.*

G. GUTTATUS, Daud.

Tail without any enlarged subcaudal plates. Colour olive grey, slaty over the head, with four or five transverse white bands. Belly white, body, limbs and belly red-spotted.

Grows to about a foot. Inhabits Eastern Bengal, Burma and the Malayan peninsula.

It lays about eight hard-shelled white eggs as big as a musket-ball, cementing them to trees, rocks, or secluded buildings. Its cry is 'tunk tay,' several times repeated, and ending in a long-drawn-out 'diminuendo' guttural rumble. The 'tunk tay' of the Burmans, notwithstanding the persecution it suffers from the lower orders of Europeans, is an interesting and really useful animal, from the number of insects it consumes. It does not confine itself to insects, but will eat young rats; and Dr. Mason has seen it devour the smaller species of house lizard. I have myself seen it seize on the wing a bat as it flew round the room, and devour it.

G. SELNOR, Cantor.

Tail with a double row of enlarged subcaudal plates. Colour brown, with some dark markings. Grows to fourteen inches. Inhabits Akyah, Burma, the Andamans, the Malayan Peninsula. The voice of this species is a 'tuk-tuk-tuk' several times repeated.

PSYCHOZOON, Kuhl.

Skin of sides expanded into a longitudinal flap.

P. HOMALOCEPHALUM, Creveldt.

A flap or expansion of skin runs along the sides of the neck and body, and the tail has a similar fringed border, scalloped. Prevailing colour some tint of olive with numerous markings. Grows to seven inches. Ranges from Arakan to the Malayan Peninsula. The Nicobars.

PHLESCMA, Gray.

Claws none. Pupil round.

P. ANDAMANENSE, Blyth.

Claws none. Colour of the live animal emerald green above, yellow below. Grows to six inches. This is a diurnal and arboreal gecko, with considerable power of changing its hues.

Inhabits the Andamans.

#### b. *Adhesive plates of feet divided.*

HEMIDACTYLUS, Curier.

Fingers and toes dilated, ovate, clawed, 5 on each limb. Pupil vertical.

H. MACULATUS, Dum. et Bib.

Femoral pores 20 to 28, in an interrupted line. Grows to five and a half inches (usually smaller). Back with numerous trihedral tubercles. A larger form, with femoral pores, 32 to 36, in a nearly continuous line, and growing to nine and a half inches, has been separated in Ceylon, as *H. Pieresi*, Kelaart.

India, Burma, and the Andamans.

H. COCTEAU, Dum. et Bib.

Femoral pores 6 or 8 on each thigh, widely separated in the pubic region. Back granular with a few tubercles in the sacral region. Grows to 9 inches, but is usually smaller.

Inhabits Northern India and Burma.

H. FRENATUS, Schl.

Femoral pores 27 to 35, in an uninterrupted line. Back granular, with scattered tubercles. Thumb very small. Grows to 5½ inches.

Ranges over the whole of India, its Islands, Burma, the Andamans and Nicobars, and the Malayan Peninsula and islands.

H. MORTONI, Theobald.

Resembles the last, but has the thumb well developed. A single female only taken at Rangoon. It approaches *H. Leschenaultii* closely.

These animals (*Hemidactylus*) are the common house Geckos of warm regions,

and are the animal intended by the word "spider" of the English Bible (Proverbs xxx. 28), rendered Gecko in the Syriac version; and in the Vulgate later translated, "The Gecko taketh hold with her hands and dwelleth in king's palaces." They are useful animals, as they feed wholly on insects, but are pugnacious little creatures, and often lose their tails in fights. During these fights the tail of one of the combatants will sometimes fall down on the tea-table, where it will wriggle like a worm for a minute or so.

*NACTERIDIUM, Gunther.*

Sides with a cutaneous expansion.

*N. SCHNEIDERIANUM, Shaw.*

This lizard stands in the same relation to *Hemidactylus* that *Psychozoon* does to *Gecko*, and probably occurs in Burma.

*PERIPYA, Gray.*

Thumb rudimentary, clawless. 5 claws on hind feet.

*P. MUTILATUS, Weigm.*

*P. Peronii, Dum. et Bib.*

Femoral pores 37 to 42, in an angular continuous line. Back uniformly granular. A cutaneous fold behind the ham. Colour pale translucent grey, with a few whitish freckles. Three pairs of chin shields. Length 6 inches.

Inhabits Ceylon, Burma and the Andamans.

Anderson says this is a common tree and house lizard at Blamio.

*P. CANTORIS, Günther.*

Very like the last, but has no chin shields. The Andamans. Anderson records it from Poonce, in Yunnan, at 3300 feet.

*DORYURA, Gray.*

Tail sharp-edged, granular above, and with a median row of plates below.

*D. BERDMOREI, Blyth.*

Tail granular above, edge denticulate, with a median row of enlarged scales below. Back granular. Grows to four inches.

Inhabits Pegu and Tenasserim.

*D. GARDANA, Theobald.*

Resembles the last, but the tail is segmented. 38 femoral pores separated on the pubis. Inhabits Toung-ngoo.

*D. KARENSORUM, Theobald.*

Back granular, with twenty longitudinal rows of white tubercles. Tail segmented, and with some transverse rows of spines. 24 femoral pores separated on the pubis. A row of median enlarged subcaudals, margined with granular scales. Grows to four and a quarter inches. Captured at Karen-choung, near Toung-ngoo.

*GYMNODACTYLUS, Spix.*

Pneumatic plates on the basal joints only of fingers and toes. The two terminal joints free. 5 claws on all limbs.

*G. WICKSI, Stöl.*

Transverse plates on the basal joints of the toes only. The two terminal joints free. Femoral pores 4 or 5 on each thigh. Length two and a half inches.

Inhabits Preparis Island.

*G. VARIEGATUS, Blyth.*

Body finely granular, with numerous enlarged tubercles. Femoral pores 16 on each thigh. Colour grey (fleshy during life), beautifully spotted with black. Tail black-banded and black-tipped. Back dark-banded, and a dark horseshoe mark on the occiput. Length over six inches. Captured at Maulmain.

*CARODACTYLUS, Gray.**C. RUBRUS, Blyth.*

Femoral pores, 3 or 4 on each thigh, in a groove. Body and tail covered with unequal tubercles. Toes free and slender, with sharply-curved claws. Colour light fleshy brown, with a dark mark on the nape, and another on the shoulders. Body and tail dark-spotted and striped. Grows to 6 inches.

Inhabits the Andamans.

*Family Agamidæ.*

Head covered with small shields. Tail long, and not fragile. Pupil round. Femoral or preanal pores none.

*DRACO, Linnaeus.*

A semicircular membrane, supported by the posterior ribs, forming a parachute. A gular sack in both sexes, largest in males.

*a. Tympanum scaly.**D. MACULATUS, Dum. et Bib.*

Gular sack very large. Nuchal crest indistinct. A series of large trihedral distant scales down either side of the back. Round black spots on the 'wings,' and pale longitudinal stripes. Grows to seven inches.

Inhabits Assam, Pegu, and Tenasserim, and Anderson got it at Pensee in Yunnan.

*b. Tympanum naked.**D. MAJOR, W. Blanford.*

Gular sack covered with scales twice as large as the ventrals. The central upper labials exceed the nasal in length. Enlarged single scales on the sides. Colour above pale, with dark bands across the parachute, broken up with pale spots. No dark fringe to the parachute. Throat greenish yellow, unspotted, and beneath the lateral appendages pale scarlet.

Length, head and body, 4·76; tail, 9·25; total 14 inches.

This, perhaps the largest species of the genus, occurs at Namlabu Hill, near Tavoy, and is nearest akin to *D. Dussumieri*, but differs in its larger labial and gular scales, size and colouration.

*D. TENIOPTERUS, Günther.*

Tympanum naked. Gular sack moderate, covered with large smooth scales. Some large scales down each side of back. Male with a low nuchal crest. 'Wings' with five arched black bands not extending to the margin.

Inhabits Tenasserim.

*JAPALURA, Gray.*

A small gular found in males.

*J. YUNNANENSIS, Anderson.*

A large spinose tubercle behind the superciliary ridge. A ridge of large tubercles over the hidden tympanum. A nuchal fold. Two canines in each jaw. Colour olive, with a tinge of brown. A black band with a yellow anterior margin from the eye to the gape. Five transverse bands on neck and back, separated by narrow olive-yellow bands. Tail banded. Under surface olive yellow.

Head and body 3; tail 7 = 10 inches.

Momien.

*DILOPHYRUS, Gray.*

A high nuchal and dorsal crest, the lobes of which are united by a membrane.

*D. GRANDIS*, Gray.

Head, neck, and gular pouch yellowish. Back purplish-brown, lilac on the sides. Seven oblique dark blue streaks down the throat. Sides of body with oblique lozenge-shaped red or yellow spots. A discontinuous mulberry-brown nuchal and dorsal crest. Scales of crest partly green and yellow. Tail banded. This is the colouring of the male. The female is probably much duller.

Length twenty-two inches, of which the tail measures sixteen.

Inhabits Penang and Pegu.

*BRONCHOCILA*, *Kaup*.

Scales regularly arranged with the tips directed backwards and downwards. Tympanum naked. Gular sack small. Tail very long.

*B. CRISTATELLA*, Kuhl.

Scales small, in 40 rows, between the vertebral line and the belly, and 14 on the belly=94 in all. Colour uniform grass green. Grows to 20 inches.

Inhabits the Malayan countries and the Nicobars.

The Karens call a green lizard the "*green viper bloodsucker*," and it may be either this species or *Calotes viridis*, Gray, of which little is known. In *Bronchocila* the scales are directed backwards and '*downwards*,' whereas they point '*upwards*' in *Calotes*.

*B. JUBATA*, Dum. et Bib.

Scales in 20 rows between the vertebral line and the belly. Colour green, with usually some yellow spots on the neck. Stoliczka records this species from the Nicobars.

*B. BURMANA*, W. Bl.

Scales in about 24 longitudinal rows, between the vertebral line and belly, on the belly in 12 rows, sharply keeled, =60, all sharply keeled. Dorsal row distinctly larger. No fold before the shoulder. No enlarged scales behind the superciliary ridge. The hind limb does not quite reach the snout. Colour grass green, paler below, without bands or patches.

Length, 3·7; tail, 12·0=15·7 inches.

Inhabits Tavoy.

Another species has been described from Travancore, *B. Indica*, Theobald, with also over 50 rows of scales round the body, but with a distinct shoulder fold, lined with minute black scales.

*CALOTES*, *Cuvier*.

Scales with the tips directed backwards and upwards.

*C. MYSTACEUS*, Dum. et Bib.

A fold before the shoulder. Colour brown or ruddy vinous, with a conspicuous white band from nostril to behind the shoulder. Seasonably the males (and some females) assume a gorgeous livery, the entire fore part of the body turning a bright deep blue, red-mottled on the throat. The largest specimen I ever measured was thirteen inches, of which the tail measured eight and a half; but Stoliczka records one sixteen inches, and Günther one of *twenty-four*; from Ceylon, though no Burmese specimens attain that size.

Inhabits Arakan, Pegu, Tenasserim, Ceylon, Siam and the Nicobars.

Dr. Mason thus writes of this species: "This is a very common species in gardens in Toung-ngoo. A pair made their home in the mango trees near my study window. The female blundered into the house a few days ago, but I found her a very unattractive animal of a uniform earth-brown colour. The male, however, is sometimes a beauty. He may be often seen jerking his head up and down, with the head, pouch and whole front of the body a glowing ultramarine blue, contrasting beautifully with the reddish-brown of the hinder part of the body and the tail. From the nose to the shoulders, below the eye, is a broad white band, which is interrupted by three reddish-brown patches, in line with the white band, before reaching the uniform

reddish-brown of the hinder part of the body. Occasionally the white band below the eye assumes a brownish colour, and the animal appears to have a brown band down each side. He does not always, however, appear in this gay dress. While I am writing I see him coming down the trunk of one of the trees in a very faded garment. His skin suggests a bright calico, after it has been washed, whose colours succumb to soap. The blue is there, but it is no longer the bright blue of yesterday. It has changed to a dull light indigo colour. He runs across the grass to the foot of another tree and stops on the bare ground at its base, where for a minute or more he bites with great energy at a struggling grasshopper ? and while thus exercising himself the blue fades out from his body altogether and his whole body takes the colour of the brown earth on which he stands. After tarrying a minute or two he ran up the other tree and the dull light blue colour seemed to return to him as he ran up the tree."

*C. EMMA*, Gray.

A black fold in front of the shoulder. Colour brownish olive, with brown bands across the back and a pale lateral streak. Grows to 11 inches, of which the tail is not quite three-fourths.

Inhabits Assam, Pegu and Tenasserim.

*C. VERSICOLOR*, Daud.

No fold in front of the shoulder. Colour brown, with darker bands or lozenges on the back, and a pale lateral band. Two black specks on the occiput. Seasonably the head and fore limbs become bright red (whence its European name of 'blood-sucker'), or limbs and tail black. Grows to sixteen inches, of which the tail is eleven.

Inhabits the whole of India and Burma.

*ORIOCALOTES*, *Gunther*.

Scales keeled, those above pointing upwards, those below downwards. Tail round. A fold before the shoulder. A gular sack in males.

*O. KAKHIENSIS*, Anderson.

No spines on the head. Scales of the body imbricate, keeled, those on the side of the back pointing upwards, those below downwards. A few large scales on the sides. A fold over the shoulder. 50 transverse rows between the limbs, and 60 or more round the body. The fore leg reaches the tip of the snout, the hind one to the gape. General colour olive, variegated with brown and yellow. Under surface olive green. A broad black band from the eye to the tympanum, two narrow ones below the eye, one in front and three above.

The upper Irrawaddy valley, where, in Anderson's opinion, it replaces the nearly allied *O. minor*, Günther.

*ACANTHOSAURA*, *Gray*.

*A. ARMATA*, *Gray*.

No gular sack. A fold before the shoulder not extending across the throat. Colour greenish-brown, with roundish light spots. Length twelve and a half inches. Inhabits Tenasserim.

A second species occurs near Rangoon with an orange vertebral line.

*TIARIS*, *Gray*.

*T. SUBCRISTATA*, Blyth.

A gular sack in males, and a fold before the shoulder in both sexes. Scales of the body very small, with some larger ones intermixed. Subcaudals in two rows, sharply keeled. Colour greenish, with some dark stripes before the shoulder. Males obliquely striped and reticulated with brown and variegated with red and yellow. Grows to fifteen inches, of which the tail is eleven.

Inhabits the Andamans and Nicobar Islands.



*Family* **Uromasticidæ.**

Herbivorous agamoids, wholly or in part of social habits.

*LOLEPS*, *Curier*.

Scales minute and granular. Tail depressed, with small square scales in transverse bands. Femoral pores. Skin of sides lax. Edible.

*L. GUTTATUS*, *Cuv.*

Colour pale reddish-brown, with numerous dark-margined orange spots on the back, and the sides sharply barred with black and orange. Tail greenish-brown, minutely yellow-dotted above. Grows to nineteen inches, of which the tail is thirteen.

Inhabits Arakan, Pegu and Tenasserim.

This very handsome lizard is herbivorous, feeding on the crocus-like flower which springs up in commencement of the hot weather in March, and is identified by Dr. Mason with *Kämpferia cantida*. This lizard has been supposed, from its expansile skin on the sides, to fly like *Dracon*; but the species is entirely terrestrial and a burrower, and is never seen on a tree and never attempts to fly. It is somewhat gregarious in its habits, and is highly esteemed as food. It is called 'Padat' by the Burmans and the *Kämpferia* accordingly 'Padat-za.'

**Order LORICATA.**

Reptiles with the body covered above by bony plates imbedded in the skin. Teeth lodged in sockets, and reproduced by endogenous succession. Vent linear, longitudinal. Vertebrae prococious.

*Family* **Crocodylidæ.**

The fourth tooth of the lower jaw fits into a notch in the upper, so as to be visible when the gums are closed. Five toes before, four behind.

*CROCODYLUS*, *Curier*.

*C. PALUSTRIS*, *Less.*

Dorsal plates in six rows. Muzzle very blunt.

This species is rare in Burma, but is found inland about Thayetmyo, and thence up the Irrawaddy.

*C. POROSUS*, *Scheid.*

Mijyoung.

Dorsal plates in eight rows. Muzzle narrower than in the last. Very common in Pegu and Burma in every tidal creek. It grows to thirty feet in length, and is a dangerous animal, especially in the rains, when an old male will sometimes attack small boats. It is dangerous, too, to walk at dusk near a river or creek tenanted by these creatures, as at such a time they are specially active, and on the look out for animals which approach the banks. They invariably drown their victims, and delay their meal till decomposition has rendered the flesh easier to tear off.

The flesh is much esteemed by the Burmans.

*GHARIALIS*, *Curier*.

*G. GANGETICUS*, *Gmel.*

The long-nosed gharial is found in the Koladyne, but has not yet been obtained in Pegu.

**Order CHELONIA.**

Shield reptiles. Vent circular. Tongue and reproductive organs single. Oviparous.

Of the three orders of Reptiles, the Chelonia are by far the most important and beneficial to man. The flesh of some marine species enjoys a world-wide celebrity for its nutritious properties and fine flavour, and in America the 'Terrapins' are an acknowledged delicacy. In Burma all species save the coarser and rank marine turtles (*Couana*, *Caretta*, and *Dermatochelys*) are highly esteemed by the natives, and undoubtedly yield a pleasant and wholesome food. Some prejudice may perhaps be allowed in the case of carrion-eating species (though few turtles feed more foully than ducks and fowls); but the hard-shelled herbivorous river turtle (*Batagur*) and the majority of land and marsh tortoises, are excellent food, and both wholesome and palatable. The eggs of all species of turtle are so highly prized in Burma that it is much to be feared that the numbers of these useful creatures will be greatly reduced by the eager search for eggs, which, so far from being checked as it should be by Government, is rather encouraged, by the right to collect them being farmed out. If this practice may perhaps not be so injurious to the sea turtles, who possess numerous island resorts not very accessible to their enemies, it is alarmingly destructive to river turtles, as the *Batagurs*, who not only lay but few eggs, 25 or thereabouts, but are compelled to resort to banks of rivers, as near Zalon for example, where every egg laid is appropriated, and the race is recruited only, as it seems to me, from hatchlings in stray spots away from the main resort of the species. As, however, the country becomes cleared and settled, the fate of these creatures will become yearly more precarious, until the species is threatened with extinction. In India, where no one scarcely eats either the turtles or their eggs, this danger does not exist; but in Burma it is a real danger to an important food supply of the people.

#### Family Testudinidæ.

Terrestrial Chelonians, with feet adapted for walking on land, in a few species only, partly webbed. Sternum concave in males, convex in females. Herbivorous.

*TESTUDO*, *Oppel*.

Caudal plate single. Toes five before, four behind.

*T. ELONGATA*, Blyth.

Colour of adults pale yellow, black-mottled, with no trace of rays, and in aged individuals but little black. Head yellow, with the soft skin of the eyes and nostrils pink. Grows to about 12 inches, and inhabits Pegu and Tenasserim. Anderson also records it as occurring in Chaibassa, in Singbhum.

*T. PLATYNOTUS*, Blyth.

Lêk-goung-ni.

Colour black, with yellow rays. Aged individuals have the back flat; half-grown specimens are more globose. Grows to about 12 inches.

Inhabits Northern Pegu and Upper Burma.

The caudal plate in these two species is single.

*MANOURIA*, *Gray*.

Characters much as in *Testudo*, but hinder toes webbed. Pectoral plates separated in males. Tangential in females.

*M. EMYS*, Müll. and Schl.

Tôr-lêk.

Colour of adults wholly black. Caudal plates two, therein differing from *Testudo*. Grows to 20 inches, and ranges from Assam through Arakan, Pegu, and the Tenasserim Provinces.

*GEOMYDA*, *Gray*.

Differs from *Testudo* in possessing divided caudals, and hind toes webbed. Zygomatic arch none.

*G. GRANDIS*, Gray.

Colour above very dark brown, almost black; below handsomely black and yellow rayed. Caudal plates 2. Grows to 18 inches.

Inhabits Pegu and Tenasserim.

This species is more aquatic in its habits than the last, and the shell is often encrusted with weeds.

*G. DEPRESSA*, Anderson.

*G. Arakana*, Theobald.

The following were the characters of an Akyab specimen in my possession.

Colour uniform yellowish, dark-mottled; below yellow. Claws of hind feet very long. An aged female measured 9·5 inches on a straight line.

Inhabits Akyab.

*G. SPINOSA*, Bell.

Shell keeled and serrated. Colour brown above; yellow below, handsomely brown-rayed. In the young each costal plate is armed with a distinct spine, which in aged animals is worn down to a tubercle. In a young shell before me, of 5 inches, the tendency to a spinous development in the plates is shown by the nuchal plate being bispinous in front and keeled, and by the 3rd and 4th vertebral keels being distinctly bispinous behind. The gular, too, presents the lateral curved spine mentioned in Günther's description.

Grows to 10 inches or more, and inhabits Pinang and Tenasserim.

#### Family Cistudinidæ.

Feet adapted for walking or swimming. The sternum usually flat in both sexes, attached to the thorax by a ligamentous suture and transversely divided into two mobile lobes.

*CORA*, Gray.

*C. AMBOINENSIS*, Daud.

Colour above dark brown or blackish, with a pale vertebral line. Below pale primrose yellow, with a black blotch on the outer posterior angle of each plate. The sternum is attached to the thorax by a ligamentous suture, and divided into two mobile lobes. Grows to ten inches.

Inhabits Pegu, Tenasserim, the Malayan Peninsula, Java, and Amboina.

*CYCLEMYS*, Bell.

The transverse pectoral suture in *Cyclemys* is formed by the permanent non-anchylosis of the pectoral-abdominal suture, indicated externally by a carious fold traversing the plates, and is more obvious in aged than in young animals.

*C. DENTATA*, Bell.

Colour pale olive, radiately brown streaked. Grows to 8 inches or more.

Inhabits Pegu and Tenasserim.

*PYXIDEA*, Gray.

No transverse sternal hinge.

*P. MOUTONII*, Gray.

Colour yellowish, browner on the sides. Shell with three keels. Sternum separated from the thorax, as in the last species, but with no transverse suture. Grows to 7 inches or more.

Inhabits Cochin China and Kachar, and probably therefore Burma, though as yet unrecorded there.

*Family Emydidæ.*

Fresh-water Chelonians, of small and medium size, with sternum and thorax united into a bony case, without lateral or transverse joints. Sternum flat in both sexes. Habits active, carnivorous. Zygomatic arch complete.

*BELLIA, Gray.*

Shell three-keeled, when young. Zygomatic arch strong.

*B. CRASSICOLLIS, Gray.*

Colour deep clouded olive above and below, without markings, but paler in spots. A small nuchal shield. The second, third, and fourth vertebrals mushroom-shaped, semicircular in front. Young shells are three-keeled. This species readily takes the hook, but is a foul feeder, not to be recommended for food. Common in Tenasserim. Grows to 7½ inches.

*MELANOCHELYS, Gray.*

Shell three-keeled. Zygomatic arch weak.

*M. EDENIANA, Anderson.*

Colour black, edges of keels and sternum yellowish. Shell three-keeled.

Grows to 12 inches.

Inhabits Arakan, Pegu, and Tenasserim. This is the Burmese representative of *M. trijuga*, Gray, of India, and *M. Seba*, Gray, of Ceylon.

*Family Bataguridæ.*

River or estuary Chelonians, mostly of large size, with solid shells, contracted internally at each end. Sternum flat in both sexes. Food mainly vegetable.

*MORENIA, Gray.*

Small-sized *Bataguroids*, with an ocellated pattern of ornamentation.

*M. OCELLATA, Dum. et Bib.*

*Emys Berdmorei, Blyth.*

Colour pale greenish-olive, with an ocellus on each costal plate. Beneath pale yellow. Shell globose. Females grow to 8 inches or more. Males are smaller.

Inhabits Pegu and Tenasserim, where it replaces or represents the allied species *M. Petersi*, Anderson. It is a thoroughly aquatic form, but during the inundations, numbers find their way from tanks and rivers over the country, and on the subsidence of the water, and the clearance of the grass by fire in April, are either captured alive, or their scorched bodies are picked up by scores by the people, who greatly relish their flesh for food.

An examination of the type specimen in Paris has enabled Dr. Anderson to decide that it belongs to the Burmese animal, and did not come as stated, from Bengal,<sup>1</sup> where the species is unknown.

*BATAGUR, Gray.*

*B. KACHUGA, Ham. Buch.*

Colour uniform greenish olive-brown, beneath yellowish. Back of the neck brownish, with seven red-brown streaks. The chin with ten yellow spots on the side. Seasonably the colours become very brilliant. Grows to 24 inches.

Inhabits Pegu and Tenasserim.

<sup>1</sup> For the Bengal species, Dr. Anderson therefore adopts a new name.

*M. PETERSI*, Anderson.

*E. ocellata*, *apud* Blyth.

Adult male 4·95; female 7·70.

*B. TRIVITTATA*, Dum. et Bib.

Lêk-pôk.

A nuchal plate always present. Colour in males pale olive-green, with three conspicuous pitchy black bands down the back. Beneath pale orange yellow. Females uniform umber brown. Seasonably the males are very brightly coloured, the head and neck being a pale crimson, fading on death to waxy white. Grows to over twenty inches.

Inhabits Pegu and Tenasserim.

An allied species, *B. affinis*, Günther, inhabits the Malayan Peninsula, and may range into Tenasserim; it is distinguished by having no nuchal plate.

*B. TRIVITTATA*, Dum. et Bib. (?).

*B. Iravatica*, Anderson.

This species appears to have originated in the fact that Dr. Anderson obtained a male specimen, of seven inches in length, which was uniform brown, and without the black streaks which characterize the males of *B. trivittata*, whose adults attain to eighteen inches. No adult brown male of *Iravatica* is known, and if, as Anderson maintains, the brown females of *B. trivittata*, as described by me, pertain to *B. Iravatica*, rather than to it, then the females of *B. trivittata* are unknown. The adult male of *B. Iravatica* is unknown, and Dr. Anderson himself states that the "skulls of the adult males and females referred by Theobald to *B. trivittata* are so alike to one another, and so resembled by the skull even of the uniformly coloured male, that I cannot seize on any animal character which would separate them specifically, unless it be the greater upturning of the nasals in the latter" (!). Dr. Anderson then adduces certain differences in the shields, but in recollection of how the scutation of some species varies with age (e.g. *Bellia crassicollis*), and the great probability that the pitchy bands of *B. trivittata* are a sexual adornment of the adult male, it seems more than probable that the young male whereon *B. Iravatica* is founded is merely the immature male of *B. trivittata*, no black-streaked male of that species being, it would seem, known of the size of Dr. Anderson's typical male, viz. 7 inches.

*TETRAONYX*, Lesson.

*T. BASKA*, Ham. Buch.

A nuchal plate always present. Four toes on all feet. Colour uniform brown. Grows to twenty-four inches.

Inhabits Pegu, Tenasserim, the Malayan Peninsula, and also Bengal.

An allied species in Borneo has no nuchal plate (*B. pictus*, Gray).

### Family **Platysternidæ** (Parrot Tortoises).

*PLATYSTERNON*, Gray.

*P. PEGUENSE*, Gray.

Head large. Tail long. Shell small. Colour above grey, below orange. A black-edged yellow stripe behind the eye. Grows to fourteen inches, of which the shell is five only.

Inhabits the streams falling into the Sittoung and Salween Rivers.

Nearly all the above-mentioned species of tortoises are excellent eating, especially the large hard-shelled herbivorous species. Some small species, as *Bellia*, are of scavenger habits, and the flesh of these animals, when captured near towns, is to be avoided; but the objection is not so strong to animals taken in the jungles. I doubt not that all species would make good soup; but the way I myself was in the habit of having the flesh dressed was in the shape of broiled cutlets, which I found very palatable and wholesome.

The next division embraces the soft or 'snapping' turtles as they are sometimes called.

*Family Chitridæ.*

Cartilaginous river turtles, with weak jaws.

*CHITRA*, Gray.

Head elongate, eyes placed very forward. The semidiameter of the skull across the mandibular condyles is contained more than three times in the distance between the occipital condyle and the palatal opening of the nostrils.

*C. INDICA*, Gray.

Colour dark olive brown, lineately marbled. Below yellowish white. No ocelli in the young. Grows to 240 lbs.

Inhabits the Irrawaddy and other rivers and estuaries of Burma. This savage and dangerous creature can be distinguished from all other 'soft' turtles, except the next species, by its weak lower jaw, and from *Pelochelys* by the proportions of the head.

*PELOCHELYS*, Gray.

Head short. Eyes placed very forward. The semidiameter of the skull across the mandibular condyles is contained twice only between the occipital condyle and the palatal opening of the nostrils.

*P. CANTORI*, Gray.

Resembles *Chitra* externally very closely, but is a smaller species, and but little known. Ranges probably the same as *Chitra*. Tickell got it at Akyab, and the British Museum possesses a specimen from Borneo.

*Family Trionycidæ.*

Cartilaginous river turtle, with strong jaws.

*TRIONYX*, Geoffroy.

*T. STELLATUS*, Geoff.

Shell brown, with vermiculate markings in the young. Head and neck grey, profusely yellow mottled.

Inhabits Pegu and Tenasserim.

*T. PHAYREI*, Theobald.

Adults brown, handsomely vermiculated. Head and neck handsomely marbled with subreniform markings.

Inhabits Pegu, Tenasserim, and the Malayan Peninsula.

*T. FORMOSUS*, Gray.

Young only known, perhaps the young of the last.

*T. PEGUENSIS*, Gray.

Head of adult pale olive-green, minutely and closely punctulated with black.

Inhabits the Tsittoung.

*T. GRAYII*, Theobald.

Head mottled as in *T. Phayrei*, but the sternal callosities much more developed. Type immature (10 inches).

Inhabits Pegu

The whole of the above species belong to that section of the genus which has the mandible inside traversed by a median ridge. *Trionyx Gangeticus*, on the other hand, and all the Bengal species, have the same part smooth, or traversed by a median furrow. *T. Gangeticus*, from Burma, is probably *T. Phayrei*, but this is not settled. All the species probably grow to a large size.

Dr. Anderson, in reviewing the various species of Burmese Trionyces in his *Zoology of Yunnan*, p. 786, falls into some serious misconceptions of my views, which it is as well to correct. First of all Dr. Anderson, speaking of *T. Grayii*, Th.

(p. 790 l.c.), describes me as recognizing the correspondence of its skull with that of *T. Peguensis*, Gray, but remarking "that the plastral characters indicated a totally different animal," and quoting in support Proc. A. S. B. 1875, p. 176. It will however be seen by turning to this reference, that I allude to *T. Peguensis*, Gray, only to remark that it is a species hitherto only known to us by its head, which is "pale olive green minutely and closely punctulated with black."

As I had never seen any sternum of *T. Peguensis* (which was founded on a head in spirit procured by me in the Tsittoung, but the body of which was not preserved), I never made any such comparison, and as a matter of fact my words quoted by Dr. Anderson refer *not* to the sternum of *T. Peguensis*, but of *T. Phayrei*. My words were, "The head (*T. Grayii*) was dried, but on moistening it the colouration of the skin was seen closely to resemble that of *T. Phayrei*, which I at first concluded it to be. *The sternal characters however indicated a totally different animal.*" Neither has Dr. Anderson any warrant for saying that I recognized any correspondence between the skulls of *T. Grayii* and *T. Peguensis*, their colouration being wholly different; what I did say was that the skulls of *T. Grayii* and *T. Phayrei* exactly corresponded in colouration, though their sternal characters did not. The head whereon *T. Peguensis* was based was fully adult, "*minutely and closely punctulated with black.*" The head of *T. Phayrei*, of the same size, is very peculiarly and differently marked, being marbled with handsome subreniform spots or marks, and not punctulated. The skulls may correspond, as Dr. Anderson asserts, but the markings are wholly unlike; and unless Dr. Anderson can show this to be a sexual character, we must hold with Dr. Gray that *T. Peguensis* "is very different from any species that has before come under my notice" (Sup. Cat. I. R., p. 99).

Not content with endeavouring to refer the well-known and abundantly represented *T. Phayrei*, Th., to *T. Peguensis*, Gray, based on an isolated head, Dr. Anderson then endeavours to sink *T. ocellatus* and *T. Grayii*, Th., to a synonym of the same species. His words are, "The head however of the latter (*T. Phayrei*) corresponds to the heads of eight turtles from the Irrawaddy, in the Indian Museum, Calcutta, which have their plastra covered with coarse granulations, and which in the form of their entoplastron piece exactly correspond to the plastron referred to *T. stellatus*, and to the plastron of *T. Grayii*" (Zool. Yunnan, p. 791). From this and contextual passages, Dr. Anderson seems to regard *T. Phayrei*, Th., *T. Grayii*, Th., *T. ephippium*, Th., *T. formosus*, Gray, *T. stellatus* (Theobald's figure), with more or less doubt in each case, to *T. Peguensis*, Gray, and the Irrawaddy species described by me as *T. Phayrei* to it *unhesitatingly*, despite its totally different colouration, and the fact that *T. Peguensis*, Gray, is based on a solitary head!

#### *EMYDA, Peters.*

Margins of the shell strengthened with numerous small bony plates.

#### *E. VITATA, Peters.*

Colour brown above, white below. Grows to 8 inches, and has the odd plate on the sternum large. *Emyda* is more cartilaginous than *Trionyx*, and consequently can more completely retract its head and limbs within its shell.

The flesh of the soft turtles is generally eaten by the Burmese, and may be good, but as they are carnivorous animals, I never liked trying it myself. In the great rivers in India, where these turtles so largely feed on human bodies, the idea of using their flesh for food is repulsive; but in Burma this is not the case, and less objection exists to its use. So my advice is, for each one to try and judge for himself. After the revelations we have had of the horrors of cows fed on the warm slush and refuse of whisky stills, I would sooner eat a snapping turtle, than preserved American beef, possessing such a history and such antecedents. To help to discern this wicked trash, it may be mentioned that the beef of the wretched animals so fed is totally destitute of fat. *Verbum sat sapienti.*

A writer, in the *Field* gives the following amusing account of the trouble some cat-fishes and these soft turtles sometimes give the fisherman whose hook they have taken:—

"Before I close this letter I must warn you against a couple of fish with which

you may meet when fishing for mahseer. One of these is a silvery-looking gentleman, with one long fin which goes all down his belly and half way up his back. He takes the spoon very freely, and you had better be very careful to knock him on the head, and make quite certain that he is dead before you start 'clearing,' as his mouth is a complete mass of small teeth like wool-carders, and he has a 'grip' like a bulldog. The other gentleman frequently makes his appearance at the end of your line when you are fishing with 'atar' for small fry. He is an innocent-looking little fellow enough; but when you pick him up to get out your hook, he suddenly shoots a spike up out of his back, and another out of each fin, and generally succeeds in giving you a reminder. I missed my shot once when stabbing at one of these fish with a shikar-knife, and got a prod in the wrist which has made me pretty careful ever since. I dissected one of these brutes last year; he could not have weighed more than half a pound, yet his fin-spikes were some three inches in length, of solid bone, and as thick as an ordinary penholder.

"The only other troublesome beast is the turtle. He eats any sort of ground-bait he can get, and runs up to an enormous size. I shall never forget the fun a friend and I had with the first one I caught. It was at Chowmook on the Poonch: the river was in a state of flood, and we were fishing in a small mill-race close to the village for such small fry as we could catch. I hooked a large turtle on strong single trout gut. Of course, hauling him out with such tackle and a ten-foot rod was an impossibility; so we kept on, chucking stones on top of him and making him run about. After a bit he seemed to be getting rather blown, and we accordingly tossed up who should go in after him and work him up to the bank with a gaff. I lost the toss, handed the rod over to my friend, denuded myself of my nether garments, and proceeded to stalk the wily turtle from the rear—a rather 'jumpy' proceeding, as, though the water was only about two feet deep, it was as thick as mud, and, although we were both ignorant, as far as personal experience went, of any facts connected with the natural history of turtles, except that they made very good soup, my friend consoled me with a casual remark that I had better look out, as a friend of his had told him that 'they bit like the devil.' I therefore approached my enemy with great care, and commenced prodding him up in the rear with the gaff. For a time all went well. He seemed quite to fall in with our views, and my chum hauled away at his head, and I shoved him from behind, until we got him with his nose and fore paws (or flappers, or whatever you like to call them) on the bank. Now, my young friend, not entirely without reason, rather fancied himself as to his personal appearance; but whether on account of the eccentricity of his costume—which consisted of a pair of bathing drawers and a 'sola topee,'—or from the fact that he had his hair cut a fortnight before within an inch of his head and hadn't shaved since, I know not, but he fairly frightened that turtle into a fit. The moment he saw him, he (the turtle I mean) threw a hand spring off the bank and 'scooted all he knew,' as the Yankees say, for my legs. I fortunately managed to check him in his wild career with the gaff, and a regular rough and tumble ensued, during which I had the luck to get the gaff hook fast in the slack skin which forms the telescopic portion of the hind limbs, and drew him on to the bank, where we laid him on his back and executed a war dance over his prostrate form. This beast weighed 22½ lb. Having ascertained this fact and let him have a few bites at the gaff handle—the results of which experiments made me thankful that he hadn't got hold of my toe—we held a board to determine how he was to be killed. The natives proposed inducing him to put his head out and then chopping it off with a hatchet; but I was very anxious to save the hook and gut, so I handed him over to my bearer to finish, and we went to dinner.

"Just as we had finished this meal, my bearer came in with a long face and said that the turtle was a 'shaitan,' and that they couldn't manage to kill him anyhow. I then got a double-edged pigsticker, and 'went for' for that turtle. I turned him over on his back, so as to get a fair shot at the thin part of his shell, and stuck him clean through the body several times. He now bled like a pig, and, as he lay quite still, I thought he was dead. My friend, however, maintained that he was only 'playing possum'; so, to make assurance doubly sure, we placed him in an inverted



'mora,' or hollow cane stool, and put a couple of heavy shingles on top of him. We then smoked a couple of pipes and turned in for the night. About midnight I was suddenly aroused by my friend's exclaiming, 'Oh, Lord, there's that infernal turtle broke loose again! He's playing the deuce all over the shop!' We jumped out of bed, and found that it was true; the gentleman had 'resurrected,' and was making even time of it round the cowshed which forms the so-called travellers' bungalow at Chowmook. We stuffed him into the 'mora' again, and piled some three hundredweights of heavy stones on top of him. In the morning we again inspected him, and were relieved to find that he was dead; probably from thirst, for he was apparently as fit as a four-year-old in the middle of the night, and was only stopped by the crushing weight we put on him. A friend joined us in the course of the day, and we had turtle soup for dinner. I don't think this was quite the right sort of turtle; at any rate, we all felt very unwell for some days afterwards, and, as my cook was an excellent one, I am sure no blame attaches to him.

"My friend killed another of 25 lbs. in the same mill-run last year. We got a native to go in after him and land him in a basket, and I killed him by getting him to bite hold of an iron tent peg and hammering it down his throat with a big stone. The ferocity of these beasts is as remarkable as their vitality. If you catch two of them and place them facing each other, they will set-to like a couple of bull-terriers. We were dragging a small one out on heavy tackle last year, and had just got his snout on the bank (I call it a 'snout,' as the head is more like that of a pig than anything else), when a retriever dog belonging to my friend ran up to have a sniff at him. The brute made a regular rush and a snap at the dog, fortunately just missing his nose. I have since heard many stories concerning the habits of the turtle, which have caused me to change my youthful idea of him, which was that he was a quiet and inoffensive animal which made excellent soup. This may be the case with the West India branch of the testudo family; but his Asian brother is a 'bad hat all round,' vicious in his temper, plebeian in his appearance, filthy in his habits, and unfit for human food; so, if you get hold of one, cut your casting line and let him go. Though he cannot bite through it, he will 'chaw' and fray it until it is utterly useless. You will take a long time killing him; and, if you make soup of him and eat it, he'll go very near killing you, unless you have the digestion of an ostrich."

As regards the best method of killing them, I know of no better than a revolver bullet through the brain. If laid on their back, the head will soon be extended with the object of righting themselves, and getting once more on their legs. A more clumsy way is by jamming the animal into a corner and extracting the heart by a slit along the hind legs. Or the animal's head may be caught in a noose, dragged out, and cut off. To do this, place a slip noose in front of the animal's retracted nose, holding the ends very short in either hand. When the head is well protruded through, draw tight, with an instantaneous jerk, but if not very sharp, the noose will miss, and the animal being alarmed will not readily put its head out again. If only wanted for food, the animal can be instantly killed by cutting through its back, the spinal marrow being thus divided and sensation at once extinguished. To boil the wretched animal, as is sometimes done, is a brutal and stupid proceeding.

### *Family Chelonidæ.*

Marine turtles, with fins in place of feet.

*Couana, Gray.*

Five pair of costal shields, often subdivided. Carnivorous. Inedible.

*C. olivacea, Eschs.*

The Indian loggerhead.

*Chelonia, Fleming.*

Four pairs of costal shields, often subdivided. Algivorous. Edible.

*C. VIRGATA*, Schw.

The Indian edible turtle. Leik-pyen-wôn.

These two species closely resemble each other, the latter only is algivorous and edible, the former being a coarse feeder, and the flesh rank. Both species inhabit the Bay of Bengal, but the former seems the most numerous.

The possession of four pairs only of costal plates forms a ready means of distinguishing the delicate and edible *Chelonia* from the coarse and rank *Couana*, which is so often unknowingly consumed in its place. The butler of the Bengal and Madras Clubs should be specially instructed in the mystery of diagnosing the two species. Dining myself once at the Bengal Club in Calcutta, I was struck with the poor quality of the turtle soup, so in the morning, I visited the turtle tank, where the fellow turtle, of the one I had feasted on, awaited his turn for the same evening. A glance sufficed to show that it was a nasty 'loggerhead' (*Couana*), and moreover that the poor beast was dead, perhaps from being put into fresh water. Let us hope there was no turtle soup that night for dinner, but these things require very sharp looking after. Of course if one does happen to die from eating bad turtle, it is put down to Cholera—or the Climate!

*CARETTA*, *Merren*.

Four pairs of costal shields. Shields keeled and imbricate. Carnivorous. Inedible.

*C. squamosa*, Bontius.

The 'tortoise shell' or Hawk's-bill turtle.

This species grows to 2 feet in length, and yields the tortoise shell of commerce. In *Couana* and *Chelonia* the plates are thin, almost papyraceous, and of little value.

*DERMATOCHELYS*, *Blainville*.

Shell subcordiform, covered with a coriaceous skin, and traversed by 7 longitudinal ridges.

*D. CORIACEA*, L.

A female of this rare species was captured near the mouth of the Ye River, in Tenasserim, on 1st February, 1862, where she had resorted to lay eggs. The shell was covered with a leathery skin of a blackish neutral colour above, covered with white spots, like splashes of whitewash. Below a pale flesh colour, blotched with neutral. The shell measured five and a half feet, and it took six men to lift the animal. This species is found in the Mediterranean Sea and on the English coast, and grows to eight hundred pounds weight. Tickell gives an excellent figure of the animal (J.A.S.B. 1862). The fore paddle of his specimen measured three feet three inches, and the body was two feet high. When surprised by Burmese fishermen, she dragged six men along with her, nearly into the sea, but was overpowered by others running up, and is now in the Indian Museum, Calcutta.

## ORNITHOLOGY.

IN the earlier edition, Dr. Mason thus prefaced his account of the birds of Burma, with a glance at the progress which a couple of decades had made in that branch of Natural History:—"The *dodo* may possibly be found there—and the *cassowary* may perhaps be met with," observed Dr. Pearson in his official charge to Dr. Helfer, when the latter was about to proceed on his scientific mission to the Tenasserim Provinces. The *dodo* and *cassowary* were about as probably inhabitants of Burma as the phoenix and ostrich; but the remark shows how little was known of our ornithology fifteen or twenty years ago. Indeed it was quite a blank until Major Playre, then in Arakan, commenced his collections, and Mr. Blyth entered on his duties as curator of the Museum of the Asiatic Society of Bengal. When I went over the birds of Burma with Mr. Blyth in 1854, I found eighty-eight species in the Museum, represented by specimens sent up by Major Playre, and these were but a fraction of the number he had furnished, many having been replaced by fresher specimens from more recent contributors. Since that period, I find more than fifty specimens, acknowledged in the Journal, as having been received from him on one occasion, in Pegu. The next largest contributors from Burma are Rev. Mr. Barbe, Captain Abbot, Mr. O'Riley, Major Bendmore, and Major Tickell."

Since Mason penned these words, many good men and true have taken up the work, as their predecessors fell out of the ranks of that army which is ever marching on—and some not unworthy successors to the first pioneers may here be quoted, Tytler, Blanford, Ramsay, Oates, de Roepstorff, Fiddlen, Armstrong, Ball, Davison, Bingham, Viscount Walden, the discriminating editor of Blyth's posthumously published list of Burmese Mammals and Birds (Jour. As. Soc. Bengal, Extra Number for 1875), and last, but not least, A. O. Hume, the zealous, able and entertaining editor of Stray Feathers. The present list has been mainly compiled from the lists given by Blyth and Hume, but below<sup>1</sup> are enumerated a few of the principal papers

<sup>1</sup> 1. List of Birds known to occur in the Andaman and Nicobar Islands, by V. Ball. Stray Feathers, I. p. 51. Species 133.

2. 'Die Papageien.' A review, hot, strong, and well laid on, by A. O. Hume, S. F. II. p. 1.

3. The Islands of the Bay of Bengal.

This is an account of a cruise undertaken by Mr. Hume in company with Dr. Stolietzka, Mr. Ball, and Mr. Wood-Mason. It is highly interesting, and crammed with amusing and instructive matter. S. F. II. p. 29.

4. A first List of the Birds of the Tenasserim Provinces, by A. O. Hume. S. F. II. p. 467.

5. Additional Notes on the Avifauna of the Andaman Islands, by A. O. Hume. S. F. II. p. 49.

6. A first List of the Birds of Upper Pegu, by A. O. Hume and Eugene W. Oates, C.E. S. F. III. p. 1.

7. A second List of the Birds of Tenasserim by A. O. Hume. S. F. III. p. 317.

8. Notes on some Burmese Birds, by Eugene W. Oates, C. E. S. F. III. p. 335.

9. Additional Notes on the Avifauna of the Andaman Islands, by A. O. Hume. S. F. IV. p. 279.

10. Notes on some Birds collected in the Eastern or Rangoon district of the Irrawaddy Delta, by James Armstrong, B.A. S. F. IV. p. 295.

11. Notes on the Nidification of some Birds in Burmah, by C. F. Bingham. S. F. V. p. 79.

regarding Burmese ornithology, which have appeared in the pages of *Stray Feathers*, and which will all repay perusal. That the present list is satisfactory cannot be admitted, some species it doubtless omits which should be inserted, and many I fear it contains, which in reality should be expunged, but anything like a critical examination of the conflicting claims of allied species to recognition is as far beyond the power of the compiler, as it is beyond the scope of the present work.

### Class AVES.

Vertebrate, warm-blooded, oviparous animals, breathing by lungs, and clad with feathers. The lower jaw is articulated to the skull by an *os quadratum*, and the skull to the atlas by a single occipital condyle.

### Order PICI.

Woodpeckers. Thit-touk.

Bill wedge-shaped. Tongue highly extensile, fleshy, barbed at the tip. Tail stiff at the points, and an organ of support in climbing. Feet short, stout, first and fourth toes turned backwards (*zygodactylous*). The two horns of the hyoid bone extend round to the back of the head, forming a loop, which can be lengthened or shortened by appropriate muscles. The *Pici* are mainly insectivorous and breed in holes of trees, laying white eggs, the males sharing the task of incubation.

### Family Picumnidæ.

SASIA OCHRACEA, Hodg.

Arakan. Pegu. Tenasserim.

*S. abnormis*, Tem. apud Hume (juv.) (S.F. vi. p. 118).

This species makes a wonderfully loud noise for its size. Davison writes:—"I have more than once thought it must have been some large woodpecker, and was astonished that I could not see it, and when at last I did discover the tiny object, I felt quite as much astonished at the sound it was able to produce, as it was at my sudden advent."

### Family Picidæ.

HEMICIRCUS CANENTE, Less.

Arakan. Pegu. Tenasserim.

Hume is inclined to separate a race from Karen-ni, described by Lord Walden as having the head "uniform deep black," which is a style of colouration wholly abnormal and unknown in the present species (Hume, S.F. vi. p. 128). Blyth

12. Notes on the Nidification of some Burmese Birds, by Eugene W. Oates, C.E. S. F. V. p. 141.

13. Notes on some Burmese Birds, by Eugene W. Oates. S. F. V. p. 247.

14. Notes on the Nidification of some Burmese Birds, by W. Davison. S. F. V. p. 453.

15. A Revised List of the Birds of Tenasserim, by A. O. Hume and W. Davison. S. F. VI.

16. After the Adjutants, by C. T. Bingham. S. F. VII. p. 25.

This is a paper to make a naturalist's mouth water, describing the author's adventures in company with Mr. Kurz, and the results of his sealing the limestone rocks near Maulmain, on which the Adjutants breed.

17. Notes on the Nidification of some Burmese Birds, II., by Eugene W. Oates, C.E. S. F. VII. p. 40.

18. A first Tentative List of the Birds of the Western half of the Malay Peninsula, by A. O. Hume. S. F. VIII. p. 37.

19. A rough Tentative List of the Birds of India, by A. O. Hume. S. F. VIII. p. 73 (and Index p. 123)

20. The Birds of the Western half of the Malay Peninsula, Second Notice, by A. O. Hume. S. F. VIII. p. 151.

21. Notes on the Nidification of some Burmese Birds, by Eugene W. Oates, C.E. S. F. VIII. p. 161.

22. Notes on some Tenasserim Birds, by Lt. C. T. Bingham. S. F. VIII. p. 190.

23. On the Nidification of *Dromas ardole*, by A. O. Hume. S. F. VIII. p. 381.

24. Notes on the Nidification of some Hornbills, by C. T. Bingham. S. F. VIII. p. 459.

describes this species as only differing from *H. cordatus*, of South India, in being constantly larger. Davison adds, "Both sexes of this species, like *H. cordatus*, bear tufts of bristly feathers in the middle of the back, which are usually covered with a gummy substance, which has a very strong, peculiar, somewhat resinous, but decidedly pleasant smell. Both the viscosity and the scent completely disappear after the specimen has been preserved a short time."

*H. sordidus*, Eyton.

South Tenasserim. Java.

*H. Brookianus*, Salvad.

Sumatra. Borneo.

Hume also inclines to unite *H. Hurlbaui*, *H. sordidus* and *H. concretus*, Tem., and to regard the Javan birds as a local race of the present species (S.F. vi. p. 128).

*ALOPHONERPES PULVERULENTUS*, Tem.

Arakan. Pegu. Tenasserim.

*Picus gutturalis*, Valen.

This is the largest Oriental woodpecker. It goes about, says Davison, in parties of from four to eight, following each other from tree to tree, keeping up a querulous call totally unlike any other woodpecker. They work high up on trees, and will desist work to utter their call and receive a reply from a comrade on some neighbouring tree. They are as wary, however, as woodpeckers in general, and dodge round a tree when seen.

*THURONAX CRAWFORDI*, Gray.

Pegu. Martaban and Northern

*Hemilophus Piddoni*, Blyth.

Tenasserim.

*T. Jerdoni*, Cabanis.

*T. JAVENSIS*, Horst.

South Tenasserim. Java. Philippines.

This species replaces the last, south of Mergui, where it is not uncommon. Hume considers there is an intermediate belt of country wherein neither species occurs, but this is highly improbable.

*T. HODGEI*, Blyth.

Andamans.

*CHRYSOCLAPTES GUTTICRISTATUS*, Tickell.

Arakan. Pegu. Tenasserim.

*C. sultanus*, Hodg.

*Indopicus Delaverti*, Muhl.

*TIGA JAVANENSIS*, Ljungh.

Arakan. Pegu. Tenasserim.

*Picus tiga*, Horst.

var. *rufa*, Stoliczka. A small race of the Malayan Peninsula and Sumatra.

Hume considers *T. rubropygialis*, Muhl., and *T. intermedia*, Blyth, as identical also (S.F. iii. p. 328, iv. p. 390).

*T. SNORRI*, Vigors (S.F. iii. p. 73).

Arakan. Pegu.

*GECCUS STRIOLATUS*, Blyth.

Pegu. Young-ngoo.

*Brachylophus xanthopygius*, Bonap.

*G. VITTATUS*, Vieill. (S.F. iii. p. 69).

Pegu. Tenasserim.

One of the commonest woodpeckers in Burma, but does not range south of the Pakchan creek.

*G. NIGRIGENS*, Hume (S.F. ii. pp. 244 and 471). Tenasserim.

This bird inhabits open bamboo jungles in the lower ranges, and, like other *Gecini*, habitually feeds on the ground. Hume considers it possible that this species may eventually prove identical with *G. erythropygius*, Elliot, in which case *nigrigenis* will sink to a synonym (S.F. vi. p. 137).

*G. OCCIPITALIS*, Vig.

Arakan. Pegu. Tenasserim.

This species has not been noticed by Davison south of Tavoy.

*CHRYSOPILEGMA FLAVINUCHA*, Gould.

Arakan. Pegu. Martaban and Tenasserim north of Mectan.

*C. CHLOROLOPHUS*, Vieill.

Khasi Hills. Arakan. Tenasserim.

This species is usually found in pairs, but Davison describes once meeting with a troop of woodpeckers near Myawudi consisting of this species, *C. flavinucha*, *G. occipitalis*, *nigrigenis*, *vittatus*, *C. Sultanus*, *T. intermedia*, *M. phaeiceps*, *T.*

*Cerapfordi*, *G. viridis*, *Y. canicapillus*, all working together, and mixed up with a lot of *Garrular Belangeri* and *montiger*, *Cissa spectosa*, etc. "Such a paradise of woodpeckers I never saw." They were probably drawn together in pursuit of a swarm of winged white ants or expelled, *en masse*, from some burning forest.

*Callolophus mentalis*, Tem.

Southern Tenasserim only. Sumatra.

*C. ruficeps*, Horsf.

Southern Tenasserim only.

A solitary bird, according to Davison, which never feeds on the ground, and has a note differing from other woodpeckers. It will ascend to the summit of a tree and there utter its peculiar cry, becoming very noisy towards dusk, when other woodpeckers are silent.

*C. malaccensis*, Luth.

Southern Tenasserim.

Davison writes that this is a bird of the evergreen forests, not occurring in the open country, but, unlike the other *Callolophi*, being rather partial to mangrove swamps.

*Blythipicus pyrrhotis*, Hodg.

Toung-ngoo. Northern Tenasserim.

This bird frequents dense grass and underwood, is very shy, and moves about in pairs, and never, according to Davison, ascends a tree till disturbed.

*B. porphyromelas*, Boie.

Tenasserim south of Mergui.

This species has all the shy stealthy habits of the last. It is fond of working on fallen trees, and avoids the open forest and large trees (Davison).

*Geinulus viridis*, Blyth.

Toung-ngoo. Tenasserim.

This bird is solitary, or seen in pairs, and is commonly found in bamboo jungles.

*Micropternis rufinotus*, Mall.

Arakan to Tenasserim.

*M. phaeiceps*, Blyth.

*M. burmanicus*, Hume.

This is quite a bird of the open country, writes Davison, and fond of gardens and bamboo clumps. It is always smeared with some gummy substance, and has a strong peculiar smell. The tails too are usually studded with ants' heads. These are the large reds of the open jungle, who, when once they seize anything, never quit their hold. These ants seize the tail feathers of the bird, but in time their bodies get rubbed off, leaving their heads adhering, sometimes in scores, on the lateral web of the tail feathers. Mr. Oates, on the other hand, remarks, that in Pegu this species is confined to the evergreen forests, and adds, "The head, top of tail, and abdomen are much smeared with some gum, or rather, as I fancy, with honey. The contents of the stomach of three specimens were black ants and a small yellow bee-like insect, the latter in considerable quantities." From this, it may be inferred that the main food of this species consists of *Hymenoptera*, both adults and larvæ, in pursuit of which its plumage gets rather daubed (S.F. iii. p. 72). A still more curious trait in this bird is that it breeds in ants' nests, according to the observations of Mr. J. Gammie, who took several so situated near Sittoung. The species of ant is not clear, but I take it *not* to be *F. smaragdina* (the edible yellow ant, whose nests are sold in the bazaar, for the acid flavour the crushed ants impart to it), but some species which makes its nests on bamboos, and of a more or less globose shape, constructed of loose materials, in the midst of which the eggs are laid. According to Mr. Gammie, the ants desert a nest so treated, and he thinks the strong smell of the bird may conduce to this result; but the habit quite explains the presence of ants among its feathers, as noticed above. As a note to Mr. Gammie's communication, Mr. Hume adds that *Haleyon occipitalis* also breeds in ants' nests (S.F. iv. p. 511).

*M. brachyurus*, Vieill.

Tenasserim south of Mergui.

*Meigleytes jugularis*, Blyth.

Arakan. Pegu. Tenasserim.

*M. tristis*, Horsf.

Southern Tenasserim. Java.

*M. tukki*, Less.

Southern Tenasserim. Singapore.

All these three species are birds of dense forest, and have the usual woodpecker note, a rolling "kirr-r-r" (Davison).

- PICTUS* MACUL, Vieill. Arakan. Pegu. Karen-ni, at 3000.  
 Blyth records this bird from Tenasserim, perhaps using the term vaguely, but Hume says it does not occur south of Karen-ni.
- P. ATRATUS*, Blyth. Martaban. Karen-ni. Tenasserim, between 3000 and 1000.
- P. ANALIS*, Horsf. Toung-ngoo. Karen-ni. Java.  
*P. pectoralis*, Blyth (monente auct.).  
 Not hitherto recorded from Tenasserim.
- P. ANDAMANENSIS*, Blyth. Andamans.  
*P. MAHRATTENSIS*, Lath. Toung-ngoo.
- Birds from Ceylon and Pegu have more white about them than those of Continental India.
- YUNGIPICUS CANICAPILLUS*, Blyth. Khasi Hills. Arakan. Pegu. Tenasserim, up to 5000.
- GAURIPICOIDES RAFFLESII*, Vig. Tenasserim.
- A rare bird, confined to the evergreen forests at the bases of the Southern and Central portions of the outer ranges of hills.
- VIVIA INNOMINATA*, Burton. Karen-ni and Tenasserim.

### Family **Yungidæ.**

- YUNX TORQUILLA*, L. Arakan. Pegu. Toung-ngoo.

### Order **VOLITORES.**

Bills various, with mostly a wide gape. No cere. Legs small and weak. Wings strong, the whole order moving solely by flight. This order embraces the King fishers, Hornbills, Barbets, Swifts, Swallows, Bee-eaters, Hoopoes, Goatsuckers, Trogons, and Humming-birds.

### Family **Megalaimidæ.**

The 'Barbets' are nearly related to the *Toucans* of South America, the clavicles being imperfect as in that family, and the feathers possessing the same supplementary plume. Their colours are green and bright, and are strikingly similar to that of the leaves of the trees they frequent. They are mainly if not wholly frugivorous, and nestle in holes of trees, laying white eggs. Their beaks are strong, and furnished at the base, or gape, with stiff bristles projecting forwards. Their voice is loud and their monotonous cries repeated without ceasing from some tree-top are among the most familiar sounds in our Indian forest-clad valleys.

- MEGALAIMA RAMSAYI*, Wald., S.F. iii. p. 402. Karen-ni. Tenasserim.  
*M. Franklini*, Blyth, apud Tickell.

According to Col. Tickell, this species "swarms from 3000 to 5000 feet elevation, not higher, nor lower, and from the first level it suddenly supplants *M. Hodysoni*."

- M. FRANKLINI*, Blyth. Khasi Hills.  
 Hume considers this species to be replaced in Burma by the last.
- M. CYANOTIS*, Marshall (S.F. iii. p. 77). Khasi Hills. Arakan. Karen-ni. Pegu. Tenasserim.
- M. MYSTACOPHANUS*, Tem. Tenasserim. Rare in the North.

The note of this bird is Tok-tok-tok uttered incessantly. It is more often heard than seen, as it frequents the tops of high trees, or else densely foliated ones. It is fond of clinging to the trunks of trees and tapping away like a woodpecker.

*M. HYMACIPHALA*, Müll.

*Xantholama indica*, Lath.

Arakan. Tenasserim. Java.

The Philippines (Blyth).

Theet-pa-dain.

Davison says it is universally distributed, but rare in Southern Tenasserim.

Jerdon remarks of this species, "Luteous varieties of this species occur occasionally, what Mr. Blyth calls '*lutinos*': these are sometimes observed in all normally green birds, as Parrakeets, and analogous to ordinary *albinos*. Its food is fruit. Blyth observed that it would munch an insect if offered, but did not swallow it. Its note is a remarkably loud 'Took-took-took,' uttered with monotonous iteration from the summit of some tree, and the bird moves its head first to one side and then another whilst uttering it." In India it is known as the 'Copper-smith,' and in Burma as the 'Smith,' and among the Karens as the 'Gong-ringer' (Mason).

*M. GRANDIS*, Gould.

Arakan. Karen-ni.

*M. Marshallorum*, Swinhoe.

This species, if it occurs in Burma, is probably confined to Arakan, being replaced to the South by the next.

*M. VIRENS*, Bodd.

Martaban.

*M. HONGSONI*, Bonap.

Khasi Hills. Arakan.

*M. lineata*, Marshall.

Pegu. Tenasserim. Java (Blyth).

Pho-goung.

Davison doubts its occurring much south of Tavoy.

*M. ASIATICA*, Lath.

Arakan. Pegu. Martaban.

Koh-kha-loung.

*M. DAVISONI*, Hume (S.F. v. p. 168).

The Tenasserim 'Yo-mah.'

*M. INCOGNITA*, Hume (S.F. ii. p. 442-446).

Tenasserim north of Tavoy.

*Caloramphus HAYI*, Gr.

South Tenasserim.

Davison says its note is a low soft whistle, and that it hunts singly or in pairs about the leaves and branches of trees, peering into every crevice and cranny of the bark, and clinging in all sorts of positions like a Tit (S.F. vi. p. 149).

### Family **Coraciidæ.**

*CORACIAS AFFINIS*, MacClelland.

Pegu.

Hnet-kah.

Of this species Blyth remarks:—Generally diffused, and always typically coloured; whereas specimens from Tippera, Sylhet, Assam, and Lower Bengal are mostly crossed more or less with *C. indica*, showing every gradation from one to the other. Gould's figure assigned to *C. affinis* in his 'Birds of Asia' represents a hybrid of the kind; and *C. indica* also interbreeds with *C. garrula* in localities where those two races meet. Eastward, the present species extends at least to Siam.

*EURYSTOMUS ORIENTALIS*.

Arakan. Tenasserim. Malacca.

### Family **Bucerotidæ.**

The Burmese, says Mason, call the larger crested Hornbills *young-yen* from *young* the kind of hair worn by men. The smaller species are called *ouk-kyen* (or *ou-chin*), perhaps from *ouk* 'to be dark,' 'gruff in countenance.'

*DICHO CEROS CAVATUS*, Shaw.

Forests throughout Burma.

*B. bicornis*, L.

Young-yen.

This fine species is said to be excellent eating (S.F. 1877, p. 20), a fact worth knowing when camping out.



*HYDROCISSA ALBIROSTRIS*, Shaw.      Young-ngoo.  
Ouk-chin.

This species is said (i.e.) to feed, when the chance offers, on fish, and to be so intent on its prey, that it may be then sometimes killed with a stick. It is probable that all species of the family prey, when they can, on any small mammal, bird or fish they can surprise.

*ANORHINUS TICKELLI*, Blyth.      Martaban Hills up to 4000.  
*A. GALLITUS*, Temm.      Malewōn and Bankasun.

A very shy and strictly arboreal species.

*ACLEOS Plicatus*, Latham.      Arakan. Tenasserim.  
Young-yen-net.

*A. SUBRUFICOLLIS*, Blyth.      Arakan. Young-ngoo. Tenasserim.  
*A. NARKONDAMI*, Hume (S.F. i. p. 411).      Narkondam Island.

The female is an exact miniature of the last, and weighs one pound only, or a third of the other. The male again is a miniature of the male of *ruficollis* from New Guinea.

*A. NIPALENSIS*, Hodg.      Kachar. Tenasserim.  
*A. UNDULATUS*, Shaw.      Tenasserim south of Amherst.  
*BERENICORNIS COMATUS*, Rafil.      S. Tenasserim. Bankasun. Malacca.

In addition to fruit, these birds eat lizards and small birds. This species has a remarkably soft flight, flapping its wings rapidly but noiselessly, and without the intermediate sailing periods so characteristic of the flight of *Hydrocissa* and *Dichoceros* (Davison).

*RHINOPHAX VIGIL*, Forst.      Malewōn and Bankasun.

The solid-billed hornbill derives its specific name from its extreme wariness, which renders it next to impossible to shoot one without days and days of laborious work. This is no doubt produced by the ardour with which they are pursued and harassed by the natives, who carve their heads into obscene love-charms, which sell for 50 rupees apiece among the superstitious people (Davison, S.F. vi. p. 115).

The Hornbills are striking objects in a Burmese forest, and the cry and noise made by the flight of *D. cavatus* is something alarming, and must be heard to be fully realized. This species lays a single egg, the smaller species laying three brownish cream-coloured eggs without gloss. When a female hornbill has excavated a hole in a tree, she is confined to her nest by the male plastering up the orifice with clay and his own dung, and so preventing her egress till the young are hatched. While so confined, the female is assiduously fed by the male with fruit, which the female is said to refuse unless fresh and choice. A singular habit is possessed by some hornbills of voiding, in the form of a sac, the lining membrane of their stomachs, which in a short time would seem to be reproduced without ill effects to the bird.

There are two papers in the Proc. Zool. Soc. Lond., which exhaustively treat of this curious phenomenon. The first is by Mr. A. D. Bartlett, P.Z.S. 1869, p. 142; the other by Dr. Murie, P.Z.S. 1874, p. 420. Mr. Bartlett from the first advocated the correct view, that this casting up the lining membrane of the gizzard was not the result of diseased action, but a curious provision for more readily feeding, by means of such a 'bolus' or 'capsule,' the imprisoned female during the period of incubation. For the fact of this imprisonment, and the assiduous attention of the male bird, he quotes both Tickell, Wallace, and Dr. Mason, and correctly remarks that the latter observer could of course not distinguish at a distance between the 'sac,' with its contents, which the male puts into the mouth of the female, and a 'fig' or fruit, as Mason presumed it to be.

Dr. Livingstone also noted the same act with respect to the African Hornbills, and added the remarkable discovery, that the bird sometimes becomes so emaciated by his attendance on the imprisoned female as to pay the forfeit of his industry with his life. Livingstone says, "During all this time, which is stated to be two or three months,

the male continues to feed her and the young family. The prisoner generally becomes quite fat and is esteemed a very dainty morsel by the natives, while the poor slave of a husband gets so lean, that on the sudden lowering of the temperature, which sometimes happens after a fall of rain, he is benumbed, falls down and dies."

It cannot be supposed, Mr. Bartlett urges, "that the mere collecting food for the female is the cause of this fatality; it is doubtless overtaxing the system, by the constant secretion of this nutritive matter, reminding one of the blood in the nests of the esculent swifts, after the birds have been robbed of the first and second nests." "That parrots and pigeons and many other birds reproduce their partially digested food during the pairing and breeding season for the support of the female and young, is well known. The tame male hornbill is particularly distinguished at all seasons by this habit of throwing up its food, which he not only offers to the female, but to the keepers and others who are known to him. The male concave Hornbill (*Buceros caratus*) now in the gardens, will frequently throw up grapes, and holding them in the point of the bill, thrust them into the mouth of the keeper, if he is not on the alert to prevent or avoid this distinguished mark of the bird's goodwill and kindness." Mr. Bartlett might have also instanced the somewhat analogous act in many young birds which void their 'feces' in a 'bag' or 'sac' which the mother flies away with in her bill, and drops at a safe distance from the nest.

Dr. Murie, in his paper (*L.c.*), figures two empty 'gizzard sacs' as he terms them, ejected by the *Buceros subcylindricus*, and conclusively proves that they are nothing more nor less than an epithelial horny bag, "the veritable gizzard lining itself, as opposed to any glandular or secretive product," and adds: "That the ejected 'sac' should retain the shape and peculiar corrugated appearance of the interior of the gizzard, is not to be wondered at, when we consider that it is but a solid, though flexible, impress of the sinuosities, elevations, and depressions of the mucous folds of that organ."

#### Family **Upupidæ.**

UPUPA LONGIROSTRIS, Jerdon.

Pegu.

Toung-pi-tsok.

Blyth considers this as merely a "deep-coloured race of *U. epops*."

#### Family **Meropidæ.**

MEROPS PHILIPPINUS, L.

Arakan. Pegu. Tenasserim. Java.

M. DAUDINI, Cuv.

Pegu. Toung-ngoo. Andamans.

M. LESCHENULTI, Vieill.

Arakan. Pegu. Tenasserim.

*M. erythrocephalus*, Gm.

Penang.

*M. Swinhoei*, Hume.

Andamans.

Lord Walden remarks: "The Malaccan habitat is doubtful. For reasons already stated (*Ibis*, 1873, p. 301), Gmelin's title, taken from Brisson, cannot be adopted. If, however, the title of *quinticolor*, Vieillot, is to be used for the Javan race, the continental form must take the name of *M. Leschenaulti*, Vieill. In either view the necessity of coining the new title of *M. Swinhoei*, Hume, does not seem apparent."

M. VIRIDIS, L.

Arakan. Tenasserim to Mergui.

var. *M. ferrugiceps*, Hodg.

NYCTIORNIS ATHERTONI, Jard. and Selb.

Pegu. Tenasserim. Karen-ni.

Pyā-twe-hnet.

N. AMICTA, Tem.

*N. Malaccensis*, Cab. (juv.)

Martaban. Pegu.

This bird is usually found in pairs, and never gregariously, as other bee-eaters are. When uttering its note 'quo-quā-quā-quā,' the bird leans forward, stretches out its neck and puffs out the feathers of its throat, and at each syllable of its note bobs its head up and down (Davison).

Family **Alcedinidæ.**

(Peing-nyen, *generic*).

*CARCINECTES PULCHELLUS*, Horsf. Malacca to Martaban and Pegu.

*C. amabilis*, Hume (S.F. i. p. 474).

*C. amabilis*, from Northern Pegu, is separated by Hume, from its wanting the red collar so marked in Karen specimens and in some from Malacca, but which is often absent in other Malaccan individuals.

*PELARGOPSIS BURMANICA*, Sharpe. Tenasserim. Andamans. Pegu. Karen-ni.  
*P. INTERMEDIA*, Hume. Nicobars.

Intermediate between *P. Fraseri* of Java and *P. leucocephala* of Bengal.

*P. AMAUROPTERA*, Pearson. Tenasserim. Karen-ni.

A species not usually found far removed beyond the tideway, though in India it also haunts the Eastern Terai.

*HALCYON PILATA*, Bodd. Pegu. Martaban. Tenasserim.  
*H. COROMANDA*, Lath. Martaban. Tenasserim. Andamans.

This is a species more usually found near the sea.

*H. CONCERTA*, Tem. Southern Tenasserim.  
*H. ATRICAPILLUS*, Gmel. Andamans. Nicobars (rare).  
*H. OCCIPITALIS*, Blyth. Nicobars.

Davison was the first to describe the curious habit possessed by this bird, of excavating its nest in ants' nests. "I found three nests on the island of Camorta, and all of them were excavated in deserted ants' nests. These ants' nests are generally placed against the trunks of very large trees, but occasionally against those of the coconut palms, at heights of from 4 to 20 feet from the ground, and vary from 12 to 30 inches in diameter, being composed, as I believe, of some sort of clay; they are extremely hard and difficult to break. It is in the larger ants' nests that this kingfisher's nest-holes are excavated. The tunnel, about 2 to 2½ inches in diameter, is in the centre of the ant's nest, and goes in for about 6 inches, where it terminates in a chamber about 7 inches in diameter" (S.F. ii. p. 172).

*H. CHLORIS*, Bodd. Martaban. Tenasserim. Andamans.  
*H. SMYRNNENSIS*, L. Universally distributed. Andamans.  
*SAUROPTIS CHLORIS*, Bodd. Common along the coast.  
*CLYX TRIBACTYLA*, Pdl. Pegu. Tenasserim. Andamans.  
*ALCEDO MEXINITING*, Horsf. Bankasum. Southern Tenasserim.  
*A. BENGALENSIS*, Gmel. Pegu. Andamans. Nicobars.  
*A. BEAVANI*, Wald. Martaban. Tenasserim. Andamans.  
*A. NIGRICANS*, Blyth. Southern Tenasserim.  
*A. ASIATICA*, Swainson. Tenasserim. Andamans.

Lord Walden considers *A. Beavani*, Hume, a synonym of this species. It really, however, matters little whether we distinguish an animal as a *variety* or *race*, or distinct *species*, so long as we do not hamper ourselves with any preconceived notion of the fixity of species, an idea certainly more strongly supported by Semitic tradition, than by the study of nature.

It is remarked by Mr. W. T. Blanford, that *Pelargopsis burmannica*, *Halcyon smyrnensis*, and *Alcedo bengalensis*, are apparently replaced in the Irrawaddy delta, where the water is salt, by *P. amauoptera*, *H. pilata*, and *A. asiatica*. According to Helfer, *Alcedo bergyllina*, Vieillot (*biru*, Horsfield), is also an inhabitant of the Tenasserim provinces, but Blyth had never seen it even from the Malayan Peninsula. The present, however, is one of the species which Helfer did procure.

*CERYLE RUDIS*, L. Martaban. Tenasserim.  
*C. GUTTATA*, Vig. Martaban.

Writing of this species Hume, remarks that, contrary to the assertion of Sharpe and other authors, the sexes are not identical in colouring. The under wing coverts

of the males are *always* white, in the females mostly pale cinnamon. This is an "absolute sexual diagnosis in adults" (S.F. vi. p. 86).

### Family **Eurylaimidæ.**

The 'Broadbills' form a small family, which may be said to represent in Asia the Todies of South America.

*CALYPTOMENA VIRIDIS*, Raffles.

Tenasserim south of Amherst.

This lovely bird is difficult to procure, as during the day they remain seated on the tops of trees, where they can hardly be discerned. They are not shy, neither are they stupid like 'broadbills,' from which they differ in habits, note and food, feeding entirely on fruit (Davison).

*PSARISOMUS DALHOUSIE*, Jamieson.

Assam, Arakan, Pegu, Tenasserim.

This species preys on insects, which it seizes on the wing.

*SERILEPTUS LUNATUS*, Gould.

Pegu. Karen-ni (3000 to 4000).  
Tenasserim as far south as Ye.

This 'Broadbill' is so stupid that if one is shot, its next neighbour will hardly move, or only to the next branch, so that the whole of a flock may be secured in rotation.

*S. RUBROPYGIA*, Hodg.

Khasi Hills. Arakan.

At Pahpoon it is very common. The call consists of a single 'Chirr-r-r.' They never walk or hop about the branches, but fly from one to another. They feed chiefly on insects, many of which they seize on the wing.

*EURYLAIMUS JAVANICUS*, Horsf.

Toung-ngoo. Tenasserim.

This is very tame, but not crepuscular like *Corydon*.

*E. OCHROMELAS*, Raffles.

Southern Tenasserim. Java.

*CYMBORHYNCHUS MACRORHYNCHUS*, Gmel.

Bassein. Tenasserim. Borneo.

*CORYDON SUMATRANUS*, Raffles.

Toung-ngoo. Tenasserim.

This species is so stupid that you may pelt it without sometimes getting it to budge, according to Tickell. It is crepuscular in its habits.

*C. AFFINIS*, Blyth.

Arakan. Tavoy.

### Family **Trogonidæ.**

The Trogons, says Jerdon, are a remarkable family of resplendent beauty, the most gorgeous being American. They manifest an affinity to the *Caprimulgidæ* in their tender skins, downy plumage, feeble feet, and other points. Their plumage is dense, but so lightly implanted as to readily come out, and the feathers have a very large supplementary plume.

The genus *Harpactes* embraces the Asiatic Trogons.

*HARPACTES DUVAUCELLII*, Tem.

Tenasserim, rarer above Mergui.

*H. ERYTHROCEPHALUS*, Gould.

Arakan. Karen-ni. Tenasserim.

*H. Hodgsoni*, Gould.

Htok-taru.

*H. ORESKIOS*, Tem.

Arakan. Tenasserim. Java.

According to Col. Tickell, *Harpactes Hodgsoni* is "common on the hills from 3000 feet upwards. Below that it is replaced by *H. oreskios*. It flies in small flocks, and is active and vociferous on the wing, solitary and quiet during the heat of the day, sitting in the shade."

### Family **Caprimulgidæ.**

The Burmese term these birds Myaywote or earth-crouchers. Bill usually small and weak. Gape very wide, guarded with strong bristles. Plumage soft and mottled.

Eyes large, habits crepuscular and nocturnal, during the day the birds perching on the ground in some sequestered spot. Eggs two, stone colour, mottled and blotched, and laid on the bare ground.

LYNCORNIS CERVINICEPS, Gould.

Darjiling. Arakan. Tenasserim.

Of this grand nightjar Davison remarks, "It makes its appearance soon after sundown, flying at a great height, and numbers coming from the same direction, uttering its full and clear whistle. As the evening advances, they descend lower and lower, till by the time it is quite dark, they are flying about within a few feet of the ground . . . I cannot imagine, and I have often wondered, where these birds roost during the day. I have walked up hill and down dale over many hundred miles of country, . . . yet only once have I flushed a *Lyncornis*, and that was brooding. . . I have noticed that when they make their appearance of an evening, they always come from the direction of the mountains, numbers following exactly in the trail of those that have gone before, and all going back exactly the same way at dawn the next morning. This I have not only noticed to be the case with *L. cerviniceps*, but also with the smaller *L. Temminckii* of the Malay Peninsula." On this point Mr. Hume suggests as just possible that they roost in caves in the hills, but the question is one that still awaits an answer, where the birds retire to, during the day.

CAPRIMULGUS INDICUS, Lath.

This species ranges, according to Blyth, throughout Burma to Malacca and Sumatra. Many Tenasserim specimens have, however, been referred to *C. Jotaka*, from Japan, and birds of this *Jotaka* type range, according to Hume, right up through Sikkim and Garhwal to Abbottabad in Hazara. Hume, in summing up, points out that these Indian *Jotakas* never quite attain the dimensions of the Japanese type, and are scarcely separable from *Indicus*. Blyth would seem to be right in regarding all as a race of *Indicus*. Its note is described by Jerdon as being *few-yo-yo* frequently repeated.

C. MACROCEPHUS, Horsf.

Throughout Burma and ranging to North Australia.

Lord Walden points out that Burmese specimens exceed in size typical Japanese ones, which is just the reverse of what occurs with the supposed Burmese *Jotakas*. Davison says of this species, "I know of nothing so thoroughly disagreeable when one is lying ill with fever in the jungle, as the monotonous call of this nightjar, which goes on incessantly from early in the evening till dawn next morning." The fever had doubtless something to say to this; for the sound to me is very soothing and pleasant, recalling calm scenes of serene beauty and many a tranquil and placid hour spent beneath the greenwood tree with the sky for canopy over all. Capt. Fielden remarks, "This bird closes its eyes, whilst seated on its eggs. This must be a great protection from hawks, as its great eyes are the most conspicuous things about it. The first time I saw this I thought the bird was dead, and stooped to pick it up, nearly touching it before it rose" (S F. iii. p. 46). The next species has been separated, though little more than a race or plumage variety of the present.

C. ALBONOTATUS, Tickell.

Toung-ngoo.

This bird may be distinguished from the last by its larger size, and by being lighter coloured and more buffy. The lower parts, too, are uniform, whereas the last species has the dark breast strongly contrasted with the paler abdomen.

C. MONTICOLUS, Franklin.

Pegu. Martaban. Tenasserim.

C. ANDAMANICUS, Hume.

Andamans.

C. ASIATICUS, Lath.

Arakan. Pegu. Tenasserim.

The note of this species, according to some, is '*Tyook-tyook-tyook*,' or as Jerdon happily suggests, like the sound made by a stone skudding over ice. There is first the ringing ti-i-ook of the stone striking the ice, and the same note repeated as though the stone had given three or four great bounds, and the note then gradually falls, as though the stone were gradually vanishing in the distance. It is a most weird and curious sound, ringing out close to one's path on some glorious bright

night when all is still around, and the early traveller is hurrying on to reach his destination before sunrise.

I once picked up a *Caprimulgus* lying dead in the road, evidently suffocated by spasm of the glottis, caused by the fore legs of a large *Mantis* impacted therein, which the bird had endeavoured, but failed to swallow. The curious thing was that the bird had not been able to free itself, even under the pangs of suffocation, from the insect which filled its mouth.

BATRACHOSTOMUS, *Gould*.

Bill broad, depressed and strong. They resemble in their plumage the little Scops-owls, and like them have a grey phase and a ruddy phase.

*B. HODGSONI*, Gray.

Karen-ni at 6000.

*B. AFFINIS*, Blyth.

Malayan Peninsula, not certainly recorded as yet from Tenasserim.

*B. CASTANEUS*, Hume.

Hume is not certain if this is not one sex of *B. Hodgsoni*, and entirely dissents from Lord Wadden's uniting it with *B. affinis*. For a lengthy disquisition of the question, which requires more data for decision, see S.F. ii. p. 318, and vi. p. 53.

### Family **Hirundinidæ.**

The swallows form a well-known and peculiar group of birds, comprising several groups marked by different habits of life and nidification. The 'common swallows' build saucer-shaped nests of mud, and lay white eggs spotted with red, all the other groups laying white eggs. The House martins build globular nests of mud. The Crag martins, saucer-shaped nests of mud. The Sand martins excavate holes in river banks, and the Republican swallows build retort-shaped nests of mud agglutinated together literally in masses on cliffs almost as closely as bees do their 'comb.'

#### HIRUNDININÆ.

Pyān-thwā.

*H. RUSTICA*, L.

India and Burma.

*H. gutturalis*, Scop.

*H. gutturalis* is a small race of the common European *H. rustica*, or chimney swallow. On the West of India *rustica* is the species met with, whilst in Burma all the specimens seem to belong to the smaller race *gutturalis*, both races blending in India and being specifically inseparable (S.F. vi. p. 11).

*H. TYTLERI*, Jerdon.

Thayet-myo. Karen-ni.

*H. ANDAMANENSIS*, Tytler.

Andamans.

Hume's remarks on this species (S.F. vi. p. 41) leave little doubt that this is a local race of *H. cahirica*, in process of differentiation, so to speak, and already arrived at the stage of demanding recognition *sub nomine proprio*.

*H. HORREORUM*, Bart.

Toung-ngoo (*vide* Wadden).

*H. JAVANICA*, Sparrin.

Southern Tenasserim (migrant).

*H. FILIFERA*, Steph.

Martaban.

*H. NIPALENSIS*, Hodg.

Martaban. Tenasserim.

*H. DOMICOLA*, Jerdon.

Andamans.

*H. STRIOLATA*, Tem.

Karen-ni, 2000 to 3000 feet.

This species depends on the authority of Lord Wadden, B. B. p. 127. Hume dissents and says, "The birds referred to, more probably belong to *Nipalensis* or *substriolata*. No one who has at all studied this group could talk of *erythropygia* as barely separable from *rufula*! The distinctions are pointed out S.F. v. p. 265 *et ante*."

*H. ERYTHROPYGIA*, Sykes.

Pegu.

*COTYLE RIPARIA*, L.

Thatōn (Martaban).

*C. SINENSIS*, Gray.

Pegu. Tenasserim (where rare).

*C. obscurior*, Hume.

These sand martins (*Cotylops*) are distributed over the whole of India and Burma and breed in vast companies in the sandy banks of rivers, giving a very animated appearance to the locality.

*CHLIDON URBEA*, L.

Martaban.

The English house martin has been noted as an occasional visitant at Maulmain.

*PRYXORHOGNE*.

Tenasserim.

A species of crag martin occurs about the inaccessible cliffs of Mooleyit, but was not secured. It was smaller and darker than *rupestris*, and possibly it might have been *concolor*.

#### CYPSELINÆ.

The swifts are distinguished from the swallows by their excessively long and pointed wings, and prodigious powers of flight. They rarely descend to the ground or perch on trees, but roost in crannies of buildings or cliffs. Their nests are composed of feathers or such light objects as can be collected on the wing. Sometimes these feathers are agglutinated together into a cardboard-like substance, on which, without any lining, the eggs are laid, and in some species the entire nest is formed of overlapping strings of mucus, secreted by the salivary glands, and these constitute the 'edible bird's nest' of the Chinese epicures. In the genus *Acanthylis* the tail feathers end in rigid spines. All the swifts lay spotless white eggs.

*A. CORACINA*, Müll.

Southern Tenasserim.

*CYPSELUS SEMIBRUCATUS*, Blyth.

Chongthapee, Southern Tenasserim.

*C. PACIFICUS*, Lath.

Assam. Tenasserim. Australia.

*C. BATASIENSIS*, Gray.

*C. palmarum*, Gray and Hard.

Hume doubts the occurrence of this, the common Indian Palm-swift, in Burma and supposes that the next species has been mistaken for it.

*C. INFUMATUS*, Selater.

Pegu. Martaban. Tenasserim.

The common Burmese palm-swift.

*C. ACUTICAUDA*, Blyth.

Andamans.

Distinguished from *C. apus* and *C. leuconyx* by wanting the white band of the latter across the rump, and by having the feet bare and whitish, and the tarsus less feathered, in place of the black feet and densely feathered tarsus of *C. apus*.

The next genus, *Acanthylis*, is distinguished by the shafts of the tail feathers ending in rigid spines.

*ACANTHYLIS GIGANTEA*, Hass.

Arakan. Tenasserim. Andamans. Ceylon.

*A. INDICA*, Hume.

Southern Tenasserim.

Lord Walden considers this as a synonym of the last, but this is not admitted by Hume.

*A. INDICA*, Hume.

Andamans. Southern India.

The birds which now follow form a small group wherein the peculiar development of the salivary glands in the breeding season reaches its maximum. In the palm swift we see the salivary secretion sparingly used to affix light feathers to the palm leaves, to form the nest, but in the *Collocalius* the secretion in question is more largely used, till in *C. spodiopygia* (and perhaps another species or two) it is solely used, and to the complete exclusion of any extraneous materials, in the construction of the beautiful gelatinous nests, so prized in China as an invigorating delicacy.

*COLLOCALIA LINCHI*, Horsf.

Mergui Archipelago. Andamans.  
Nicobars. Java.

A race of this species has been named *C. affinis* by Tytler, and should the Java bird prove distinct, Tytler's name must be adopted for the Andaman bird generally recorded as *C. linchi*, S.F. ii. p. 157. This species breeds abundantly in the Andamans and Nicobars in caves, but of late years it has taken to building inside houses. Their

nest is brown, and mainly composed of moss agglutinated to the rock by the salivary secretion. They roost according to Davison at night like a swarm of bees all huddled together, and clinging to the bare boards in a wonderful manner. These nests of course are never collected.

*C. FRANCICA*, Gmel.

The Andamans. Tenasserim.

*C. fusciphaga*, Horsf. (fide Walden).

This species no doubt produces an edible nest, but I am unaware if it has been taken in Burma.

*C. SPONDIOPYGIA*, Peale.

The Andamans.

This is the species which affords an edible nest in the Andamans (Little Button Island). Mr. Hume thus describes it: The nest, except just at its junction with the rock (where it is brownish), is composed of the most exquisitely silvery white gelatine, exteriorly the surface is compact and somewhat roughened in laminae, interiorly it is a network of the finest and whitest threads, reminding one of the *Euplectella*. The true nest, which is pure white, and in shape rather more than half of a shallow cup, is from 2 to 2 $\frac{3}{4}$  inches broad, stands out from 1 $\frac{1}{2}$  to nearly 2 inches from the wall, and varies interiorly in depth from little more than one-half to a full inch. The attachment films and foundation below the true nest, both of which are somewhat brownish, vary excessively according to the site chosen for the nest; in some they are almost wanting, in others the film extends for an inch on either side beyond the nest; and the foundation below the most projecting point of the true nest may be 1 $\frac{1}{4}$  inches in depth. The nests are dotted about in the darkest corners, and as a rule are separate, though occasionally two or even three may be found joined together.

"The nests of this species (*not linchi*) are collected for the Pinang market, and it has not as yet been noticed at the Nicobars, where *linchi* abounds."—S.F. ii. p. 160.

*C. INNOMINATA*, Hume.

The Andamans. Tenasserim.

Allied to the Nilghiri *C. unicolor*, Jerdon, but twice the weight of that species, besides other differences (S.F. i. p. 294, vi. p. 49.)

*DENDROCHELIDON CORONATA*, Tickell.

Pegu and Martaban.

This species is rare in Southern Tenasserim, and replaced by *D. klecho* on the Malayan Peninsula.

*D. COMATA*, Tem.

Tenasserim south of Mergui.

*D. LONGIPENNIS*, Raf.

Tenasserim south of Mergui.

This species Davison thinks ranges a little farther north than the last.

#### Order SCANSORES.

Bill never arched from the base, no cere. Tongue not extensile. First and fourth toes turned backwards. In some the bill is small (*Cuculidæ*), in others as large almost as the rest of the bird (*Rhamphastidæ*).

#### Family Cuculidæ.

Many of this family are remarkable for the habit they have of laying their eggs in the nests of other birds, and in such cases we often find that the bird lays an egg similar in character to that of the bird selected by it, as foster-parent for its young. For example, *Endynamys orientalis* lays in the nest of the common Indian crow (*C. impudicus*), and its egg is accordingly green and blotched and spotted, something in corvine style. *Coccytes*, too, lays a pure and deep blue egg, identical in colour with the eggs of the *Malucocerei*, whose nests it honours with its choice. On the other hand, we must not build too elaborate conclusions on these seemingly adaptive correlations, as the common cuckoo lays a spotted egg wholly unlike those of its most commonly adopted foster-parents, the hedge sparrow, whose egg is of a uniform delicate blue.



## CUCULINÆ.

CUCULUS CANORUS, L.	Pegu and Martaban.
C. SONNERATI, Lath.	Pegu. Tenasserim. Java.
C. MICROPTERUS, Gould, ♂.	Tenasserim. Java.
C. stratus, Drapiez, ♀.	Andamans. Nicobars.

Hume first discovered that these two species (as supposed) were merely different sexes of the same bird (S.F. iii. 79).

HIEROCOCYX NANUS, Hume.	Southern Tenasserim.
H. NISICOLOR, Hodg.	Tenasserim.

For the doubtful synonymy of this species, see S.F. v. p. 96.

H. SPARVEROIDES, Vig.	Arakan. Pegu. Tenasserim.
H. strenuus, Gould.	

This species has a fine loud call, and from its hawk-like aspect and mode of flight, darting suddenly from one clump of trees to another, causes dreadful commotion among all the small birds of the neighbourhood, who mistake it for a hawk (Davison, S.F. vi. p. 157).

CACOMANES THREXODUS, Cab.	Bengal. Pegu. Tenasserim.
C. rufiventris, Jerd.	

The earlier name is applicable to the smaller race, which is found in Southern Tenasserim, whilst the larger race of Bengal spreads down into Pegu, and blends with the other to the south (S.F. vi. p. 158).

POLYPHASIA TENTHREDINIS, Gray.	Bengal. Arakan. Tenasserim.
--------------------------------	-----------------------------

The Indian race is distinguishable from the Burmese, where grey-billed specimens are not met with, but the two races merge into each other, and, according to Blyth, in Bengal you meet with "every variation and shade of intermediateness." It lays its eggs in the nest of some species of *Prinia*.

SECNICULUS LUGERIS, Horsf.	Arakan. Tenasserim. Java. Ceylon.
S. dicuruioides, Hodg.	

Jerdon describes this remarkable cuckoo as "clad completely in the disguise of a common king-crow" (*Dicrurus*), whilst Davison shot a specimen in the act of being fed by its foster-parent, *D. annectans*, and Blyth plausibly conjectures that the pure white eggs sometimes found in the nests of *Dicruri* belong to it.

LAMPROCOCYX MACULATUS, Gmel.	Arakan. Tenasserim.
Cuculus Malayanus, Raffles.	

CHALCOCOCYX XANTHOMYCHUS, Horsf.	Pegu. Tenasserim. Andamans.
----------------------------------	-----------------------------

A rare species described in S.F. ii. p. 191.

COCYSTES COROMANDUS, L.	Arakan. Pegu. Tenasserim.
-------------------------	---------------------------

This species lays blunt blue eggs in the nests of the *Malacocerci* or 'Quaker thrushes.'

C. JACOBINUS, Bodd.	Pegu.
---------------------	-------

Fielden describes this bird as hawking moths like a *Drongo*, and having noticed a pair of young birds together, concludes that it lays two eggs in one nest.

EUDYNAMYS MALAYANA, Cab. and Heine.	Arakan. Pegu. Andamans.
Oo-aw.	Nicobars. Tenasserim.

This species is migratory in Tenasserim, a few only being resident; but in March, according to Davison, "the whole place becomes alive with them, and they continue very numerous till July," when the bulk of them disappear. Their note resembles the words 'who are you,' and is so incessantly repeated as to become a perfect nuisance (Davison). This species is the Burmese representative of the common India 'Coel,' and doubtless, like it, lays its eggs in the nest of some crow.

## PHLENICOPHAINÆ.

This division of the Cuckoos embraces those non-parasitic species which build their own nests and lay white eggs. These nests are of sticks, domed, lined with leaves and concealed in dense bushes. The eggs are usually four in number, and blunt ovals.

*PHLENICOPHAUS TRISTIS*, Less. Arakan. Pegu. Tenasserim. Siam. Malacca. Wā-phalac.

"The flight of this species is weak, and it relies more for its safety on the dense and impenetrable character of the places it prefers to frequent. It has a marvellous capacity for making its way through dense cover. Its note is a peculiar cat-like chuckle, often heard when the bird is threading its way through dense cover" (Davison, S.F. vi. p. 163).

*P. SUMATRANUS*, Raffl. Tenasserim south of Mergui.

This species is common at Mergui. Its note and habits are precisely the same as *P. tristis*.

*P. DIARDI*, Less. Tenasserim south of Mergui.

This species ranges as far north as Mergui, where it is replaced by the next. Hume makes representative species of each other north and south of Mergui, but Blyth makes both species co-exist at Pinang and Malacca.

*P. JAVANICUS*, Horst. Tenasserim.

A rare species.

*P. ERYTHROGNATHUS*, Hartl. Tenasserim south of the Ye River.  
Sumatra. Borneo.

*RHYNORHTA CHLOROPHLEA*, Raffl. Southern Tenasserim.

In its habits this species, says Davison, resembles *Phanicophaus*, but has quite a different note, a peculiar cat-like *mew*, not the chuckle of the others. Adult males have the head rufous and black-banded tails, and adult females grey heads and chestnut tails (S.F. vi. p. 167).

*CENTROPUS BENGALENSIS*, Gmel. Pegu.

Bōk.

Oates says that both males and females call, as he shot a female in the act of calling. Its note Mr. Oates describes as 'Hoop-hoop-hoop-kurrook-kurrook-kurrook,' the first note being repeated three times, the last some six or seven (S.F. iii. p. 81).

*C. INTERMEDIUS*, Hume. Arakan. Pegu. Tenasserim.

*C. rufipennis*, Illiger (part).

This Burman race has been separated by Hume from that inhabiting Southern India, in which Lord Walden concurs.

*C. ANDAMANENSIS*, Tytler. Andamans.

*C. EURYCERCUS*, A. Hay. Tenasserim.

Lord Walden remarks:—"Introduced by Mr. Hume in his list of birds of the Tenasserim provinces (S.F. ii. p. 473), but without the exact locality being stated. Two distinct species seem to be included by him under the title. The smaller may possibly be *C. rectunguis*."

## Order PASSERES.

Bills various, but never arched from the base. Tongue not fleshy. No cere. Toes three in front, one behind. Feet strong, perching. Females smaller than the males and less highly coloured. Nests often elaborate. Young hatched naked and blind. This order embraces all the Song birds, the 'Sun birds' (*Nectarinidæ*), which in Asia so feebly represent the gorgeous *Trochilidæ* of the New World, the Creepers, Nut-hatches, Ant-thrushes, Fly-catchers, King-crows, Butcher-birds, Warblers,

Thrushes, Wagtails, Wrens, Tits, Weaver-birds, Avadavats, Finches, Larks, Wax-wings, Chatterers, Pastors, Starlings, Orioles and Crows.

Sub-order *TENUIROSTRES*.

Bill long, slender, mostly curved. Legs strong.

Family *Nectariniidæ*.

The Honey-suckers, like the Humming-birds of America, chiefly feed on the nectar of flowers, but add thereto the minute insects found about flowers, and some subsist mainly on spiders. The males only are adorned with brilliant plumage, which is seasonal in some, in others permanent (Jerdon). The nest is an elaborately constructed purse, suspended from a slender twig, and opening at the side, and the eggs 2 or 3 in number.

*ARACHNOTHERA MAGNA*, Hodg. Sikkim. Arakan. Pegu. Martaban.

This species frequents hilly tracts, but is rare in Tenasserim proper.

*A. AURATA*, Blyth. Toung-ngoo. Karen-ni, at 2500 feet.

*A. LONGIROSTRA*, Lath. Arakan. Pegu. Tenasserim.

*A. pusilla*, Blyth.

Frequents gardens, and is commonly seen clinging, back downwards, to the purple bract leaves of the young plantain bunches, its head turned up inside the bract, busily sucking the nectar from the inflorescence concealed beneath the purple sheath (Hume).

*A. MODESTA*, Eyton. Tenasserim south of Mergui.

The grey-breasted spider-hunter.

*A. CHRYSOGYNYS*, Tem.

The lesser yellow-eared spider-hunter.

*ANTHREPTES HYPOGRAMMICA*, Müll. Southern Tenasserim.

*A. SIMPLEX*, S. Müll. Southern Tenasserim.

*A. MALACCENSIS*, Scop. Tenasserim.

*NECTAROPHILA HASSELTII*, Tem. Arakan. Pegu. Tenasserim. Java.

*Leptocoma Braziliæna*, Gmel.

Both the above species are rare in the North, but common towards Mergui.

*ÆTHOPYGA CARA*, Hume. Martaban. Tenasserim.

For a key of all the species of this genus, see S.F. v. p. 71.

*Æ. MILES*, Hodg. Pegu. Martaban.

*Æ. DABRYI*, Verr. Mooleyit and Karen-ni, at 4000 feet.

*Æ. NICOBARICA*, Hume. Nicobars.

*Æ. SANGUINEPECTUS*, Wald. Mooleyit and Karen-ni, at 3000 feet.

*Æ. GOULDIE*, Vig. Assam. Arakan.

Mr. Blyth also considers it probable that *Æ. Nipalensis*, *Æ. saturata* and *Æ. ignicauda*, will all be found to range from the Khasi Hills into Arakan.

*CHALCOSTETHA INSIGNIS*, Gould. Southern Tenasserim.

*CHALCOPARIA SINGALENSIS*, Gmel. Assam. Arakan. Pegu. Tenasserim.

*ARACHNOTHERA ASIATICA*, L. Arakan. Pegu. Martaban.

*A. PECTORALIS*, Horsf. Nicobars.

*A. FLAMMAXILARIS*, Blyth. Southern Tenasserim.

*A. ANDAMANICA*, Hume. Andamans.

*DICEUM CRUCIATUM*, L. Arakan. Pegu. Tenasserim.

*D. TRIGONOSTIGMA*, Scop. Arakan. Pegu. Tenasserim.

*D. CHRYSORRHOÏUM*, Tem. Khasi Hills. Arakan. Tenasserim.

*D. OLIVACEUM*, Walden. Toung-ngoo. Karen-ni. Andamans.

*D. virescens*, Hume.

*D. ERYTHROHYNCHA*, Latham. Arakan. Tenasserim.

Blyth describes this species as extremely fearless and familiar.

*PRIONOCHILUS PERCUSSUS*, Tem. Southern Tenasserim.

Feeds mainly on small berries, and the *Loranthus* (Davison).

*P. MACULATUS*, Tem.

Tenasserim south of Mergui.

*P. MODESTUS*, Hume.

Tenasserim south of Mergui.

*MYZANTRE IGNIPETUS*, Hodg.

Karen-ni at 4000 feet and Mooleyit.

### Family **Certhiidae**.

The Creepers are divided into two subfamilies, the *Certhiinae* with the bill curved and the tail feathers stiff, and used to assist the birds in climbing trees, etc., and *Sittinae* with straight bills, and which do not use the tail as an aid in climbing.

#### CERTHIINÆ (Creepers).

*CERTHIA DISCOLOR*, Blyth. Karen-ni, at 5000 feet.

Nearly allied to the common European creeper, *C. familiaris*, but has a longer tail.

#### SITTINÆ (Nut-hatches).

*SITTA MAGNA*, Ramsay. Karen-ni.

The type was a *female*, not a *male*, as originally stated (S.F. vi. p. 201).

*S. NEGLECTA*, Walden. Toung-ngoo. Karen-ni. Pegu Hills.

Specimens from Thayetmyo, shot by Oates, are described by Hume as intermediate in size, between *castaneiventris* and *cinnamomeiventris*, but referred to *neglecta*. Oates describes his birds as common on the hills, but replaced in the plains by the next species.

*DENDROPHILA FRONTALIS*, Horsf.

Arakan. Pegu. Tenasserim. Ceylon.

*D. corallina*, Gray.

Java. Borneo.

Neither Hume nor Walden admit the attempts of Gray to separate *corallina* of Pegu from *frontalis* of Burma. It would be curious to know what Dr. Gray really understood, or supposed that he understood by these geographical expressions.

These birds are described by Davison as very active and rapidly uttering their cry of *Chick-chick-chick* the while. They never descend a tree, as woodpeckers sometimes do, backwards or tail first, but always head first.

### Sub-order **DENTIROSTRES**.

Bill slenderly conical, the beak notched at the end. Food chiefly insects. Jerdon divides the thrush-like birds of this group into *Myiotherinae*, or ground-thrushes, *Merulinae*, or true thrushes, and *Timaliinae*, or babbling thrushes.

#### MYIOTHERINÆ.

### Family **Troglodytidae**.

The wrens are not numerous in Burma, and always at about 4000 or more.

*PROEPIGA SQUAMATA*, Gould.

Karen-ni at 4000 feet.

*P. FUSILLA*, Hodg.

Mooleyit.

*TURDINULUS ROBERTI*, God.-Aust.

Mooleyit, above 5000 feet.

*BRACHYPTERYX NIPALENSIS*, Hodg.

Mooleyit, above 5000 feet.

*B. CRUSALIS*, Blyth.

Karen-ni at 5000.

*B. DIANA*, Less.

Pegu.

*MYIOPHONUS TEMMINCKII*, Vigors.

Pegu.

*M. EUGENI*, Hume.

Pegu. Toung-ngoo. Pahpoon.

One of these species occurs in Karen-ni, though, as Lord Walden unites both species, it cannot be said which it is. Davison is strongly of opinion the two are distinct, and can be distinguished in the jungle by the colour of the bill alone (S.F. vi. p. 237).

The next family comprises those interesting birds the 'Dippers,' or water ouzels (*Hydrabates*), and the bright-coloured Pittas (*Brachyurus*), or ant-thrushes.

The 'dippers' plunge into the water and run along the bottom, or even fly beneath the surface (as it is said). They form a large nest of grass, with a hole on one side, and lays 5 or 6 white eggs. The genus has not been recorded from Burma, but probably ranges into Arakan.

### Family *Brachyuridæ* (Pittidæ).

*HYDRORNIS OATESI*, Hume. Karen-ni, 2000 to 4000. Tenasserim.

*H. Nipalensis*, Hodg. apud Blyth, B.B.

Hume separates the Burmese race from the Indian (S.F. i. p. 477). They are very numerous at the base of Mooleyit, and have a clear full double-whistled note (Davison).

*BRACHYURUS CYANEUS*, Blyth. Arakan. Martaban. Tenasserim.

Myai-young.

*B. MOLUCCENSIS*, Müll.

Arakan. Pegu. Tenasserim.

*B. MEGALHYNCIUS*, Schl.

Tenasserim. Banka.

*B. CUCULLATUS*, Hartl.

Nipal. Arakan. Pegu. Tenasserim.

*B. CERULEUS*, Rafll.

Southern Tenasserim.

The Tenasserim race is larger than the type, and for this race Hume has proposed the name *B. Davisoni*. They are very shy birds, and not at all like the other *Pittas*. Directly they catch sight of you, they rise, and fly low, but rapidly, for a couple of hundred yards, and then disappear in the forest (Davison).

*B. GURNEYI*, Hume.

Southern Tenasserim.

This is a shy species, and when disturbed hops rapidly away to cover, keeping some obstacle intervening between itself and the approaching person. It has a habit of jerking up its tail and trailing its wings slightly as it hops along, which is not observed in its congeners (Davison).—S.F. vi. p. 344.

These bob-tailed thrushes, or *Pittas*, are handsome, but rather leggy and gaudy birds, which feed largely on ants, and have but feeble powers of flight. Jerdon, speaking of the *Pitta Bengalensis* in the Carnatic, describes them as literally blown away from their haunts by the strong winds which usher in the hot weather, at which time they take refuge in huts, out-offices, or any building that will give them shelter, and are thus caught alive in considerable numbers. Oates records a similar mishap which the Pegu *Pittas* (*Moluccensis*) suffer from: "This bird appears by fits and starts. A sharp gale from the south-west in May will bring them in by the dozen, but they disappear again a day or two afterwards" (S.F. vi. p. 107).

*ANTHOCINCLA PRAYREI*, Blyth.

Pegu 'Yoma.' Tenasserim.

This bird is an aberrant, but undoubted member of this family. Its most remarkable feature, besides its unusually sober colouration, is a pair of remarkable aigrettes (so to speak), which project backwards fully an inch behind the occiput. The general colour is a rich brown, but the reddish hue of the lower tail coverts, as well as the habit and build, point to its relationship to this family.

*ZOOTHERA MARGINATA*, Blyth.

Khasi Hills. Arakan. Karen-ni, at 2000. Mooleyit at 5000 feet.

### MERULINÆ.

The true thrushes are birds of moderate size and of sombre colours, black or brown, or in some cases blue. They feed on the ground and frequent woods and gardens, preying largely on worms and mollusks. In winter many of them are migratory and gregarious in cold climates.

*CYANOCINCLA CYANEA*, L.

Arakan. Pegu. Karen-ni.

*C. solitaria*, Müll.

Tenasserim. Andamans.

Several species have been discriminated, which seem to have a certain geographical range; *C. longirostris*, Bl., from Kashmir and Afghanistan, identical with the European bird. *C. pandoo*, Tytler, from Western and Southern India; *C. affinis*, Bl., from Sikkim, Bengal and Burma; and *C. Manillensis*, auct., from China and the Philippines. Hume inclines to the view that in *Cyanocincla*, as in *Tora*, whilst the females exhibit little variation, the males differ greatly with locality, whence the *solitaria* of the present bird (S.F. vi. p. 247).

This is an abundant cold weather visitant, and a very tame and familiar bird.

ORECLES ERYTHROGASTER, Vig.	Karen-ni.
O. CINCLORHYNCHUS, Vig.	Arakan.
GEOTICILA CITRINA, Lath.	Arakan. Pegu. Tenasserim.
G. ALBOGULARIS, Blyth.	Andamans. Nicobars.
G. INNOTATA, Blyth.	Burma.

Hume considers these last two birds as distinct. They are not improbably local races of *Citrina*.

MONTICOLA SAXATILIS, L.	Upper Burma.
TURDUS OBSCURUS, Gmel.	Khasi Hills. Arakan. Pegu. Java. Tenasserim. Andamans. N.E. Asia.

A cold weather visitant.

T. PALLIDUS, Gmel.	Karen-ni and Mooleyit, at 5000 feet.
T. rufulus, Drap.	Andamans.

A rare cold weather straggler.

T. SIBIRICUS, Pall.	Karen-ni, Mooleyit 2500 to 6000.
---------------------	----------------------------------

A rare cold weather straggler.

OREOCINCLA MOLLISSIMA, Blyth.	Karen-ni at 5000.
O. DAUMA, Lath.	Karen-ni at 5000 feet. Mooleyit.

A rare cold weather straggler.

O. INFRAMARGINATA, Blyth.	Andamans.
---------------------------	-----------

### Family Timaliidæ.

PARADOXORNIS GULARIS, Horsf.	Karen-ni, at 5600 feet.
P. RUFICEPS, Blyth.	Sikkim. Khasi Hills. Arakan.
SUTHORA BRUNNEA, Anderson.	Momien. Yunnan.
S. MANIPURENSIS, God.-Aust.	
S. Dyflacensis, God.-Aust.	

A species of *Suthora* was noticed at Mooleyit, which Hume thinks may perhaps be this species.

GAMPSORRHYNCHUS RUFULUS, Blyth.	Nipal. Sikkim. Arakan. Karen-ni.
G. torquatus, Hume.	

*Torquatus* is of course the Burmese race, with trivial variations which have led to its specific separation.

PYCTORIS SINENSIS, Gmel.	Arakan. Pegu. Martaban. Karen-ni.
P. ALBIBROSTRIS, Jerdon.	Thayetmyo.

This species has not been recognized since its discovery by Jerdon. Hume thinks it is identical with the last, to which indeed its describer likened it, whilst noting a difference in the bill and its approach to *Paradoxornis*. In other instances, it may be added, Mr. Hume exhibits an impatience with other men's species, not on the intelligible ground, that we have too many shadowy species already, but because (as it would seem) neither he nor Davison have come across them, and they are not in consequence 'hall-marked' in S.F.

TRICHOSTOMA ABBOTTI, Blyth. Arakan. Martaban.

Barely separable from *Brachypteryx sepiaria*, Horsf. = *Myiothera grisea*, Leyden Mus. = *Malacopteron olivaceum*, Strick., in Lord Walden's opinion.

T. MINOR, Hume. Tenasserim.

*Drymocataphus furlus*, Walden.

Lord Walden thinks that "if distinct from the Indian species," this is true *Abbotti*. What this means is not clear, as *Abbotti* is the only Indian species of the genus!

T. RUBIGINOSA, Walden. Karen-ni.

ALCIPPE NIPALENSIS, Hodg.

*A. Phayrei*, Blyth (momento auctore, B.B., p. 115).

*A. magnirostris*, Walden (title Hume).

Hume in his list keeps these apart, pointing out certain differences in colour and range, *Nipalensis* representing, as might be anticipated, the Maulmain race; *Phayrei* that occupying the plains.

TURDINUS CRISPIFRONS, Blyth. Limestone Ranges in Martaban and Tenasserim.

These are lively sprightly birds, always peering about the abrupt crags, which form their home, and with lowered wings and erected tail frequently pouring forth a fine and powerful song (DAVISON).

T. BELUCEDATES, Blyth.

Moolayit at 5000 feet.

T. GULFAIS, Tickell.

Lower spurs of the main Range of hills in Tenasserim.

STACHYRIS NIGRICEPS, Hodg.

Arakan. Pegu. Tenasserim.

Tickell records it from forests at 3000 feet.

S. RUFIFRONS, Hume.

Butan. Arakan. Pegu.

*S. pracognitus*, Swinhoe (?).

Hume thinks that *S. ruficeps*, Blyth, which is inserted by Lord Walden in B. B. from Karen-ni, is really this species.

S. ASSIMILIS, Walden.

Moolayit, above 5000 feet.

S. CHRYSIA, Hodg.

Arakan.

MINORNIS RUBRICAPILLUS, Tickell. Pegu. Martaban and Northern Tenasserim.

M. GULARIS, Horsf.

Southern Tenasserim.

These are, it may be presumed, respectively the Northern and Southern races of one species, not improbably differentiated, as they seem, by the unexplored break of 110 miles between Thayetchoing and Mergui (S.F. vi. p. 267).

TIMALIA PILEATA, Horsf.

Nipal. Bengal. Arakan. Pegu.

*T. Jerdoni*, Walden, ♀.

Tenasserim. Malayan Peninsula.

*T. Bengalensis*, God.-Aust.

Java.

Jerdon describes this species as having the greatest geographical range of any of its family, and as a consequence it was bound to undergo much, at the hands of earnest naturalists, its friends. Of necessity a widely-spread species will display local variations—but why magnify these into species? The practice really recurs *ad nauseam*, and should be abandoned. For some pungent remarks by Mr. Hume on *T. Jerdoni*, see S.F. vi. p. 268.

CYANODERMA ERYTHROPTERA, Blyth.

Southern Tenasserim.

In this species the plumage and size of both sexes are identical. The nest is a ball of reed leaves, with a circular entrance on one side very like that of *My. cornis rubricapillus* and *Dumetia* (S.F. vi. p. 270).

MALACOPTERON MAGNUM, Eyton (apud Hume). Pakehan.

A rare straggler from the south, and has much of the Bulbul in its deportment. (DAVISON). The males are larger than the female, and there are two allied races, of which the present is the *larger*. Some naturalists, however, bestow this title

on the *smaller* species, and Blyth's *synonymy* of it to the larger. Only *magnum* apud Hume, occurs in Tenasserim (S.F. vi. p. 270).

*M. cinereum*, Eyton.

This species is not yet recorded in Tenasserim.

Hume amusingly sums up Eyton's work on these two species. *Magnum* is based on a *female* of the large species, described as a *male*. The *male* of *cinereum* he described as the *female* of *magnum*. Then a *female cinereum* is described as a *male*, but for all this, *mutatis mutandis*, *magnum* and *cinereum* must stand as the names of the two species (S.F. vi. p. 271). This I quote to show the absolute necessity of correctly sexing all birds whereon descriptions are based. Guessing, is highly misleading.

*M. ferruginosum*, Blyth.

Neighbourhood of Pakchan.

*M. bicolor*, Lesson (apud Hume).

*M. magnirostris*, Moore.

Southern Tenasserim.

*Dryocaptes nigricapitatus*, Eyton.

Malewon.

A rare straggler into Southern Tenasserim, but common in the Malayan Peninsula. Davison says its habits are nearest *Turdinus macrodactylus*.

*Pellorneum tickelli*, Blyth.

Pegu. Tenasserim.

*P. minus*, Hume.

Godwin-Austen, Lord Walden, and Hume are all at loggerheads about the correct synonym of this species; but so far as *Tickelli* is concerned, Hume's arguments for its retention are conclusive.

*P. subochraceum*, Swinhoe.

Pegu. Tenasserim.

*P. ruficeps*, Swains (apud Blyth).

*P. minus*, Hume (?).

A lively little bird, which hunts almost entirely on the ground. Its cry is like the words, "pretty dear, pretty dear."

*Pomatorhinus phayrei*, Blyth.

Arakan. Tavoy.

This would seem to be the Burmese race of *P. ferruginosus*, Blyth. Hume, it is true, has doubts if it occurs in Tenasserim, and equally doubts that *ferruginosus* came (as said) from Sikkim; it is not clear therefore whence these unhappy birds really could have come from!

*P. albigularis*, Blyth.

Mooleyit. Tenasserim, at 5000 feet.

*P. Mariae*, Walden (fide Hume).

Hume rather unkindly remarks of this species *Mariae*, that if it differs from *albigularis*, the "points of difference have been most unfortunately omitted from the description." Score one for the commoner!

*P. ochraceiceps*, Walden.

Mooleyit and Karen-ni, at 2500 feet.

*P. schisticeps*, Hodgs.

Sikkim. Pegu.

*P. leucogaster*, Gould.

Karen-ni at 3000. Northern Tenasserim.

Lord Walden considers these two species identical. Hume contends that *schisticeps* is the larger species from Sikkim and Pegu, and *leucogaster* the smaller race from the eastward and south. The probability seems to be that the two are well-differentiated races of the same species.

*P. olivaceus*, Blyth.

Mooleyit. Central and Southern Tenasserim.

This species replaces the last to the south (S.F. vi. p. 283).

*P. nuchalis*, Tweeddale.

Karen-ni.

A variety Hume thinks of *leucogaster*.

*P. erythrogenys*, Vig.

Pahpoon and Thatone.

This species builds a domed nest so cleverly hidden with dead leaves as to almost defy detection. It lays three white eggs according to Hutton.

*Orthorhinus hypoleucus*, Blyth.

Cachar. Arakan.

*O. Tickelli*, Hume.

*O. Inglisi*, Hume.



Those who consider a little more or less colour here or there, or even slight difference of size, constitutes a species, can separate the above birds; but the more natural method is to regard each as a local race of one species, the first described, of course taking precedence.

The next birds are the laughing thrushes, which form so prominent a feature in the Burmese jungle. They are moderate-sized birds, of rather plain plumage, and gregarious, noisy and amusing.

*GARRULAX LEUCOLOPHUS*, Hardwicke.

Arakan.

*G. BELANGERI*, Lep.

Pegu. Tenasserim.

Davison describes this species as going about in flocks of from 10 to 30, and almost always in company with *G. moniliger* and *Chinensis*, *Cissa speciosa* and sundry drongas, woodpeckers, etc. On the slightest alarm they all fly up into the trees and commence calling vociferously, one taking the lead and the others following in rapid succession. This continues for several minutes, then there is a pause, and absolute silence ensues. Then they start again, then pause, and so on. Once having disturbed them, or roused their suspicions as to one's character and intentions, it is difficult to get rid of them, as they follow one about through the forest, making a most hideous row all the time, and of course disturbing every living thing. Dogs especially seem to attract their notice, and they go on vituperating them from all the surrounding trees even more energetically than they do the sportsman. They have another queer habit. Small parties of them, 3, 4 or 5, will get on to an open space and begin to dance, spreading their tails, lowering their wings and threading in and out among themselves as though dancing a minuet, whilst all the rest of the flock watches the proceedings, with intense interest, from every branch and applauds in the jolliest and heartiest fashion. Their note is a loud laughing chuckle, which they delight in uttering spontaneously on the slightest provocation (S.F. vi. p. 287).

*G. SIREPITANS*, Tickell.

Tenasserim Hills and Mooleyit above 3500 feet.

This species resembles the last in voice and habits, but is very shy, and instead of following a stranger about, at once beats a rapid retreat. If the sportsman, however, sits quietly, and sends a dog forward, their curiosity and anger combined will tempt them back into shot range. They will follow the dog back, peering down at him from the trees and jeering at him in an uproarious fashion (Davison).

*G. CHINENSIS*, Scop.

Martaban. Tenasserim.

*G. ALBOGULARIS*, Gould.

Tavoy, fide Blyth. (Hume never got it.)

*G. MONILIGER*, Hodg.

Arakan. Tenasserim.

This is common and very like the next species, but smaller and less robust.

*G. PECTORALIS*, Gould.

Arakan. Karen-ni. Tenasserim.

Davison only shot one specimen, so it must be rare to the south. It was shot out of a mixed flock of *Belangeri* and *moniliger*, among which it was conspicuous for its size. Blyth remarks that in Arakan specimens, the pectoral band is sometimes wanting, and the ear coverts are darker. Mr. Hume draws attention to the curious fact that this is as it were a large edition of the last; yet the two races, as we might call them, occupy the same area to a great extent, and without any intermediate connecting links.

*TROCHALOPTERON MELANOSTIGMA*, Blyth.

Karen-ni. Tenasserim Hills. Mooleyit, above 3000 feet.

*ACTINODURA RAMSAYI*, Wahlen.

Karen-ni at 3000 feet.

*SIBIA MELANOLEUCA*, Blyth.

Mooleyit and Tenasserim Hills above 3000 feet.

*S. PICAOIDES*, Hodg.

Karen-ni and Tenasserim above 3000 feet.

The three next birds belong to a familiar group called by the natives 'seven brothers,' the family number, or by Europeans 'rat birds,' from their resemblance when running to a rat. Their plumage is untidy and dull-coloured, and their favourite mode of progression is by hopping. They build moderately neat nests and lay four blue eggs.

CRATEROPUS EARLI, Blyth.	Pegu.
C. GULARIS, Blyth.	Pegu.
C. CAUDATUS, Dumeril.	Arakan. Pegu.

The next species is a dweller in grass and reeds. The males have the alaudine trait of soaring and singing, but it is generally regarded as near the 'Chatterers.'

MEGALURUS PALUSTRIS, Horsf.	Pegu. Tenasserim.
-----------------------------	-------------------

### Family Brachypodiidæ.

The short-winged thrushes are made by Jerdon to include the *Pycnonotinae* or Bulbuls; the *Phyllornithinae*, or green bulbuls; the *Ireninae*, or blue birds; and the *Oriolinae* or Orioles.

#### PYCNONOTINÆ.

(Bulbuls).

HYPSIPETES PSAROIDES, Vig.	Arakan.
H. CONCOLOR, Blyth.	Northern Tenasserim.
<i>H. Funanensis</i> , Anderson.	

Blyth regards the following species as geographical races of this bird: *H. Ganesa*, Sykes, of South India; *H. nigerrimus*, Gould, of Formosa; and *H. pernix*, Swinhoe, of Hainan. In *H. leucocephalus*, Gmel. (= *Turdus melaleucus*, Gray; *H. nireiceps*, Swinhoe), of China, however, we have the same type, with the coral-red bill, but the black cap replaced by pure white; a remarkable variation, which is repeated among the black-headed and white-headed cinnamon-coloured munia grosbeaks.

H. TICKELLI, Blyth.	Karen-ni. Kyouk-nyat. Palpooon. Mooleyit, from 2500 to 4000 feet.
H. MACCLELLANDI, Horsf.	Arakan. South China.
H. MALACCENSIS, Blyth.	Tenasserim south of Mergui.
IOLE VIRIDESCENS, Blyth.	Arakan. Toung-ngoo. Tenasserim.
HEMIXUS FLAVULA, Hodg.	Arakan. Tenasserim. Pine Forests on the Salween.
<i>H. Hildebrandi</i> , Hume.	
<i>H. Davisoni</i> , Hume.	

Lord Walden regards this last as a representative race of *flavula*, and Blyth makes the same remark of *H. castaneinotus*, Swinhoe, from Hainan. Hume himself describes his two species as the "Northern and Southern allied races," and such they doubtless are (S.F. vi. p. 299).

ALCERUS STRIATUS, Blyth.	Mooleyit at 5000 and at like elevations elsewhere.
TRACHYCOMUS OCHROCEPHALUS, Gmel.	Southern Tenasserim.
CRINIGER FLAVICOLLIS, Gould.	Arakan. Tenasserim.
<i>C. griseiceps</i> , Hume.	

Hume's bird is a local race, distinguished by the feathers being washed with a cinereous tinge.

C. OCHRACEUS, Moore.	Tenasserim south of Mergui.
C. PHLEOCEPHALUS, Hartl.	Tenasserim south of Mergui.
C. TRISTIS, Blyth.	Tenasserim south of Mergui.
TRICHOLESTES CRINIGER, Hay.	Tenasserim south of Mergui.

The next genus embraces the 'Bush bulbuls' of Jerdon.

IXOS FLAVESCENS, Blyth.	Khasi Hills. Arakan. Northern and Central Tenasserim up to 4500 feet.
I. FINLAYSONI, Stickl.	Arakan. Tenasserim. Siam.
Pok-wā.	

"This," remarks Mason, "is a very common bird in Maulmain, and in the dry season its musical, though little varied notes, are often heard. It is rarely seen at Tavai."

T. BLANFORDI, Jerdon.	Karen Hills. Thayet-myo.
T. ANSECTANS, Wadden.	Rangoon.
T. FLUMOSUS, Blyth.	Tenasserim south of Mergui.
T. BRUNNEUS, Blyth.	Tenasserim south of Tavoy.
T. FUSILLUS, Salvad.	Tenasserim south of Mergui.
OTOCOMPSA ANALIS, Horsf.	Tenasserim south of Tavoy.
O. MONTICOLA, MacClell.	Khasi Hills. Pegu. Tenasserim.

Blyth remarks: "Probably *O. jocosus*, var. *siuensis*, J. Anderson, from Bhamo. Barely separable from *O. jocosus* of Bengal and Northern India, which again only differs from *O. fuscicaudata*, Gould, of South India, by having white spots on its rectrices. Another instance of different local races or subspecies. Mason remarks that this is one of the most common birds in the neighbourhood of Tavoy."

O. EMERIA, L.	Pegu. Andamans. Nicobars, introduced.
The red-whiskered Bulbul.	
IOLE OLIVACEA, Blyth.	Tenasserim.
I. VIRIDESCENS, Blyth.	Toung-ngoo. Tenasserim.
RUBIGULA FLAVIVENTRIS, Tickell.	Arakan. Pegu. Karen-ni. Tenasserim.

Davidson describes this as a sprightly bird, but with very few feathers on the neck, so that it rarely makes a good specimen.

BRACHYPODIUS MELANOCEPHALUS, Gmel.	Arakan. Toung-ngoo. Karen-ni. Tenasserim.
------------------------------------	---

*B. cinereiventris*, Blyth.

Lord Walden remarks:—"I have great doubts whether this is a species distinct from *B. melanocephalus*. It seems to be rather a variety, the yellow of the nape and under surface being changed to grey. A Malaccan example in my collection is in a stage of transition from yellow to grey. Where not grey, these examples do not differ from *B. melanocephalus*. Mr. Blyth describes 'the tail-feathers as being less deeply tipped with yellow,' etc., but the rectrices in these two examples are identical with those of Malaccan and Burman specimens of *B. melanocephalus*. In Sumatran *Ixus chalcophthalmus* all the yellow plumage of *B. melanocephalus* is changed to grey, the black and metallic parts only remaining the same in the two forms. Whether it be considered as a distinct species or not, *B. cinereiventris* is an interesting example of an 'incipient' species."

For remarks in support of this view, see Hume (S.F. vi. p. 319).

B. FUSCO-FLAVESCENS, Hume.	Andamans.
IXIDIA CYANIVENTRIS, Blyth.	Southern Tenasserim.

A rare straggler from the Malayan Peninsula.

PYCNOPTES HEMORRHOUS, Gmel.	Arakan. Pegu. Toung-ngoo.
<i>P. pygæus</i> , Hodgs.	
<i>P. nigropileus</i> , Blyth.	
<i>P. intermedius</i> , Hay.	
<i>P. pusillus</i> , Blyth (Madras).	

Lord Walden remarks (B.B. p. 135), "Rangoon examples more properly fall under the *race* named *pygæus*, by Hodg. This appropriate title, which had been adopted by Jerdon, Blyth, and other *accurate* authors, was changed through misprint, or other error, in the Hand List No. 3957, to the inappropriate title of *pygmæus*," which is the larger of the two! Score one for my Lord!

M. ATRICAPILLUS, Vieill.	Karen-ni. Palpooon. Tenasserim, north of N.L. 13°.
--------------------------	--

#### PHYLLORNITHINÆ.

The plumage of the 'green Bulbuls' (*Hæc-scing*) is grass-green, varied with blue and yellow markings about the head. In some species the wings are blue,

showing a passage towards *Irena*. They make a slight cup-shaped nest of grass and lay four white eggs, spotted with purplish or claret-red blotches and spots. When settled in a tree, they are very difficult to distinguish from the leaves.

*PHYLLOORNIS JAVANENSIS*, Horsf.

Mookeyit. Tenasserim.

*P. viridis*, Horsf. ♀ juv.

For synonymy see S.F. vi. p. 321.

*P. CHLOROCEPHALUS*, Walden.

Arakan. Pegu. Toung-ngoo. Karen-ni.  
Tenasserim.

*P. AURIFRONS*, Tem.

Arakan. Ava. Pegu. Karen-ni.

*P. Hodgsoni*, Gould.

*P. HARDWICKII*, Jard. and Selby.

Arakan. Karen-ni. Tenasserim.

*P. CYANOTOXON*, Tem.

Southern Tenasserim.

A rare straggler from the Malayan Peninsula.

For an able review of the genus *Iora*, see Hume, S.F. v. p. 420.

*IORA LAFRESNAYI*, Hay.

Tenasserim south of Mergui.

*I. VIRIDISSIMA*, Tem.

Tenasserim south of Mergui.

A very rare straggler from the Malayan Peninsula.

*IORA TYPHIA*, L.

No less than nine distinct synonyms are quoted by Hume, and his views may be summed up by an extract from S.F. iii. p. 130. "My contention is—

1st. If you base the distinctness of the species on difference of habitat, then I can show typical *typhia* from the extreme South of India and *Zeylonica* from Burma. . . . .

2nd. If you base the distinctness of the species on difference of size, then I can show equally big and equally little birds in both plumages.

3rd. If you base the distinctness of species on difference in plumage, then I say we can show every stage between the two typical forms." Hence Hume concludes that there is only one species in place of the many quoted.

Lord Walden adds (Birds of Burma, p. 137):—"Javan *I. scapularis*, ♀, is certainly not separable from *I. typhia*, ♀; the bill however is shorter. *I. viridissima* is not the male of *I. scapularis*. *I. viridis*, Bp., may be the male of *I. scapularis*, but then it is difficult to separate *I. viridis* from *I. typhia*. *I. viridis*, described from Bornean examples, occurs also at Malacca, and is the species referred to above as the *I. typhia* of those countries. It is certainly of a much deeper yellow underneath than *I. typhia* of India and Burma, having the chin, cheeks, throat, breast, and under tail-coverts intense golden, much deeper than in *I. Zeylonica* in full plumage, and it is but little less brilliant in the female. The bill, too, is somewhat stouter than in *I. typhia*, and much more so than in Javan *I. scapularis*, a character also relied on by Bonaparte. As it is possible that *I. typhia* does sometimes assume this rich golden colour, although in the many individuals I have examined I have never met with one, *I. viridis* had better, for the present, remain a synonym of *I. typhia*. Of the males, one Tonghoo example (April 19) has the interseapular region black. Another (April 15) has the entire head and nape black. A Rangoon individual (June 6) has the occiput and nape black, forehead mixed black and green, some interseapulars turning to black, or reverting to green. All the rest (a large series) green above. A Karen-nee male, in otherwise typical plumage, has the middle pair of rectrices broadly tipped (quarter of an inch) with green, remainder very narrowly tipped with green, outer pair fringed on inner and outer margins, and tipped with the same colour. This example has the chin, cheeks, throat, and breast very deep yellow, but not golden, as in *I. viridis*. The mutations, both in colouring and markings, which exhibit themselves in all the members of this genus, have been too little studied and are too little known to entitle any one at present to pronounce dogmatically on the subject. The problem is a much deeper one than whether *I. Zeylonica* and *I. typhia* are to stand in our lists as titles representing one species or two distinct species. The admitted fact that the occurrence of birds in the *I. Zeylonica* garb are exceptional in

Burma and the rule in Ceylon and peninsular India, whereas breeding males are rarely (as yet recorded) found in Ceylon and peninsular India in *I. typhia* plumage, is one that cannot be disposed of or accounted for by a mere dogmatic assertion that all belong to one species. Cf. Captain Cock (Hume, Nests and Eggs, p. 297)."

## IRENINÆ.

I have followed Jerdon in ranking the "fairly blue-birds" next to the *Orioles*, in place of next to the 'Drongos,' where Gray placed them, from peculiarities of the bill. They are however frugivorous, and their rich glistening blue colour and their full rich notes point to their closer relationship with *Phyllornis* and *Oriolus*.

IRENA PTELLA, Lath.

Arakan. Pegu. Tenasserim. Andamans.

*I. indica*, Hay.

## ORIOLINÆ.

ORIOLES INDICUS, Jerdon.

Arakan. Pegu. Tenasserim.

*O. indicus*, Brisson (*partim*).

*O. chinensis*, L. apud Hume, S.F. iii. p. 132.

*O. diffusus*, Sharpe (see S.F. *sup. cit.*).

*O. MACROCEPHALUS*, Blyth.

Andamans.

*O. TENUIROSTRIS*, Blyth.

Arakan. Pegu. Karen-ni. Martaban.  
Tenasserim.

*O. MYLANOCEPHALUS*, L.

Arakan. Pegu. Karen-ni. Martaban.  
Tenasserim. Andamans.

*O. XANTHOGOTUS*, Horsf.

Southern Tenasserim.

A rare straggler from the Malayan Peninsula.

*O. TRAILLI*, Vig.

Assam. Arakan. Tenasserim.

Head, neck and wings black, the rest of the plumage red.

*O. ANDAMANENSIS*, Tytler.

Andamans.

The next family is that of the Warblers, comprising a number of small birds which are mainly insectivorous, a few only feeding on fruit.

Family **Sylviidæ**.

This family is divided by Jerdon into seven groups: *Saricolineæ*, Stone-chats and Wheatears; *Ruticillineæ*, Redstarts and Bush-chats; *Calamoherpinae*, Grass warblers; *Drymoeinae*, Wren warblers; *Phylloscopinae*, Tree warblers; *Sylviinae*, Grey warblers; and *Motacillineæ*, Wagtails and Pipits.

## SAXICOLINÆ.

The *Saricolineæ* are solitary birds, with pied plumage, and some of them have an extremely fine song. They are very pugnacious, and nestle in holes of banks, trees or buildings, and lay four pale-bluish eggs with some dark spots.

COPSYCHUS SAULARIS, L.

Arakan. Pegu. Tenasserim.

The Dayal of India so often caged both for its song and its fighting propensities. The Andaman race, Hume says, is intermediate between *saularis* and *Mandauensis*.

*C. MUSICUS*, Raffles.

Southern Tenasserim.

CERCOTRICHUS MACRURA, Gmel.

Arakan. Pegu. Tenasserim.

This fine songster, the Shāma of India, may be termed the Burmese nightingale, keeping up its song as it does, long after dark.

*C. ALBIVENTRIS*, Blyth.

Andamans.

MYIOMELA LECURUS, Hodg.

Mooleyit, above 3500 feet.

PRATINCOLA CAPRATA, L.

Arakan. Pegu. Tenasserim north of Tavoy.

*P. INDICA*, Blyth.

Arakan. Pegu. Tenasserim. Andamans.

This may be a race of *P. rubicola*, L., but Hume shows "the two are really invariably distinguishable at a glance; the upper tail coverts and lower part of the rump in *Indica* are never *striated*. I have tested this fact in about two hundred specimens" (S.F. vi. p. 331).

*P. LUCURA*, Blyth.

Pegu. Toung-ngoo. Pahpoon.

*P. FERREA*, Hodg.

Arakan. Pegu. Tenasserim. Karen-ni.

#### RUTICILLINE.

*RUTICILLA AUREORA*, Pall.

Assam. Pegu. Siberia.

A winter visitant.

*R. FULIGINOSA*, Vig.

Arakan. Pegu.

The plumbeous redstart frequents mountain torrents, and may often be seen on a wet slippery rock, just above a boiling rapid. It climbs up the wet rocks with great facility, and every now and then spreads its tail out, but without vibrating it, like some Redstarts. It is a pugnacious bird, and delights to engage and drive off the little *Enicurus Scouleri*, which frequents similar spots (Jerdon).

*CHELMORHORNIS LEUCOCEPHALA*, Vig.

Sikkim. Arakan.

A winter visitant.

*LARVIVORA CYANE*, Pallas.

Martaban. Tenasserim.

*OREICOLA JERDONI*, Gould.

Bassein.

*Rhodophila melanoleuca*, Mull. apud Jerdon.

*CALLIOPE KAMSCHATKENSIS*, Gmel.

Arakan. Pegu. Karen-ni.

*CYANECULA SUECICA*, L.

Arakan. Pegu. Tenasserim. Andamans.

*C. caerulescens*, Pall.

#### CALAMOTHEPINE.

*ACROCEPHALUS ORIENTALIS*, Tem. and Schl.

Southern Tenasserim.

A rare visitant.

*A. STENTOREA*, Hump. and Ehren.

Arakan.

*A. AGRICOLUS*, Jerdon.

Tenasserim. (Kodai galay.)

A rare straggler from Bengal, which it quits to breed in the north.

*A. BISTRIGICEPS*, Swinhoe.

Tavoy (in a Nipa swamp).

*A. DUMETORUM*, Blyth.

Arakan.

*ARUNDINAX LEOX*, Pall.

Arakan. Tenasserim. Andamans.

*LOCESTELLA LANCEOLATA*.

Southern Tenasserim.

A winter visitant.

*L. SUBSIGNATA*, Hume.

Andamans (Aberdeen).

*UROSPHENA SQUAMICEPS*, Swinhoe.

Southern Tenasserim.

A winter visitant.

*HOREITIS PALLIDIPES*, Blanford.

Sikkim. Pahpoon. Northern Tenasserim.

*H. SERICEA*, Walden.

Karen-ni Hills.

#### DRYMOICINE.

The tailor birds, *Orthotomus*, are so called from stitching together two or more leaves with thread or fibre, within which shelter it makes a nest of wool or other soft materials, laying 3 or 4 white eggs, spotted with reddish-brown. It will also select the curling over end of a broad zinziberaceous leaf, weaving the ends together, and in this dependent state, the nest is entered from below the leaf, which completely shelters it from sight.

*ORTHOTOMUS SUTORIUS*, G. R. Forster.

Pegu. Karen-ni. Tenasserim. India.

*O. longicaudatus*, Gmel.

*O. phyllorrhampheus*, Swinhoe.

*O. EDILA*, Tem.

Tavoy. Siam. Java.

A barely distinguishable race from the last (*fide* Walden).

O. FLAVI-VIRIDIS, Moore.	Pegu. Pahpoon.
O. <i>nitidus</i> , Hume.	
O. CORONATUS, Jerdon and Blyth.	Sikkim. Mooleyit. Tsankoo hills at 3000 feet.
O. ATRIGULARIS, Teml.	Tenasserim.
O. RUFICEPS, Less.	Southern Tenasserim.
A rare straggler from the south.	
PRINIA FLAVIVENTRIS, Deless.	Arakan. Pegu. Tenasserim.
P. GRACILIS, Franklin.	Pegu.
P. <i>rufescens</i> , Blyth ( <i>vide</i> Walden).	Arakan. Pegu.
P. BEAVANI, Walden.	Karen-ni, Pegu. Tenasserim.
P. REFULA, God.-Aust.	Salween Valley.
P. HODGSONI, Blyth.	Pegu ( <i>vide</i> Walden).
Hume suggests if <i>rufula</i> has not been mistaken for this (S.F. vi. p. 348).	
CISTICOLA SCHLENICLA, Bonap.	Arakan. Pegu. South China. Nicobars.
C. CURSITANS, Frank.	Martaban. Tenasserim.
SEYA CRINIGERA, Hodg.	Pegu.
S. ERYTHROPILLURA, Walden.	Toung-ngoo.
DEYMICA BLANFORDI, Wald.	Toung-ngoo.
D. LONGICAUDATA, Tickell.	Arakan.

PHYLLOSCOPINÆ.

NEORNIS FLAVOLIVACEA, Hodg.	Pegu?
N. ASSIMILIS, Hodg.	Naga Hills. Karen ni.
PHYLLOPNEUSTE FUSCATA, Blyth.	Arakan. Martaban. China. Andamans.
P. AFFINIS, Tickell.	Toung-ngoo.
P. INDICUS, Jerdon.	Toung-ngoo ( <i>vide</i> Hume).
P. <i>griseolus</i> , Blyth.	
P. BRUNNEUS, Blyth.	Arakan.
P. MAGNIROSTRIS, Blyth.	Arakan. Toung-ngoo. China. Andamans.
P. <i>Indicus</i> , Blyth.	
P. <i>borealis</i> , Blasius.	
P. VIRIDANUS, Blyth.	Arakan. Pahpoon. Maulmain.
P. <i>Schwartzi</i> , Radde.	
P. <i>Serbohmi</i> , Hume (?).	
P. LUGUBRIS, Blyth.	Pahpoon. Andamans. Great Coco.
P. BROOKSI, Hume.	Pahpoon.
P. TENELLIPES, Swinhoe.	Tenasserim.
A winter visitant.	
P. PLUMBEITARSUS, Swinhoe.	Maulmain.
REGULOIDES CORONATA, Tem. and Schl.	Southern Tenasserim.
K. TROCHILOIDES, Sund.	Darjiling. Pegu. Tenasserim. Pahpoon.
R. <i>viridipennis</i> , Walden.	
R. <i>flavo-olivaceus</i> , Hume.	
R. SUPERCILIOSUS, Gmel.	Arakan. Toung-ngoo. Tenasserim.
R. PROREGULUS, Pallas.	Arakan. Pahpoon.
R. CROCIBROA, Hodg.	Karen-ni at 3000 feet.
CULCIPETA TEPHROCEPHALUS, Anderson.	Upper Burma. Pegu. Tenasserim.

Differs from *C. Burki* in its smaller bill.

In the next genus (*Abroornis*) there are two types of colouration, in one, the head is grey, in the other, chestnut.

ABROORNIS SUPERCILIARIS, Tickell.	Sikkim. Pegu. Martaban. Karen-ni.
A. <i>flaviventris</i> , Jerdon.	Tenasserim.

For an emended description of this bird see S.F. vi. p. 140.

A. CHRYSÆA, Walden.	Karen Hills.
---------------------	--------------

The author of this species is doubtful if it may not be identical with *Reguloides fulviventris*, God.-Aust., founded on a carbolized example in which the green and yellow have been discharged or turned grey. Hume gives a caution on this point in S.F. vi. p. 319: "It is a curious fact, that you can manufacture *civoreiventris* (*Brachypodius*) or the Sumatran *chaleocephalus* or any intermediate form to any extent by the use of a little carbolic acid. When the colour is pure yellow, as at the tips of the tail, the feathers come out *white*, as in these parts in *chaleocephalus*; but wherever the peculiar olivaceous green prevails, there the feathers remain of the exact ash grey, that we find in *civoreiventris* and *chaleocephalus*. The curious yellow green of *melanocephalus* is in fact a combination of ash grey and pure yellow, and whether species or local races, all that has happened in *civoreiventris* and *chaleocephalus* seems to be that, for some reason, the skin has in places (*civoreiventris*) or wholly (*chaleocephalus*) ceased to secrete the yellow pigment."

A. XANTHOSCHISTUS, Hodg.

Nipal. Sikkim. Arakan.

#### SYLVINÆ.

Few of this group of warblers occur in India, and none have as yet been recorded from Burma.

#### MOTACILLINÆ.

Jerdon divides them into Hill Wagtails, with rounded wings and the tertials not lengthened, the true Wagtails with lengthened tertials and unstreaked plumage, and the Titlarks, with streaked plumage.

##### *Hill Wagtails.*

*HENICURUS LESCHENAUETI*, Vieill.

Lord Walden remarks:—This Javan and Foochow bird is stated by Mr. Hume to have been obtained in the neighbourhood of Palpoon and at Meeta Myo. If the identification is correct, an interesting fact. It may perhaps be *H. frontalis*.

*H. FRONTALIS*, Blyth.

Tenasserim south of Mergui.

*H. IMMACULATUS*, Hodg.

Khasi. Arakan. Pegu. Tenasserim.

Hume doubts if this species ranges so far south as Tenasserim, but it is improbable that Blyth assigned a habitat without cause.

*H. SCHISTACEUS*, Hodg.

Arakan. Tenasserim. China.

It is less common in Arakan than the last species.

*H. GUTTATUS*, Gould.

Khasi Hills. Arakan.

*H. RUFICAPILLUS*, Tem.

Southern Tenasserim.

A straggler from the south, and the rarest species there.

*Henicurus* is an aberrant group, with affinities to *Hydrobata*. Their plumage is black and white, and they have pale fleshy-white legs.

##### *True Wagtails.*

*MOTACILLA LUZONENSIS*, Scop.

Arakan. Pegu. Tenasserim. Andamans (?).

[Toung-ngoo (*W. R.*). The black-backed, white-faced species, is referred to under the above title. But strictly Sonnerat described the grey backed bird. While Seopoli in his diagnosis, taken from Sonnerat, misquoted the description, and converted the word "grey" into "black." The members of this section of the genus which inhabit Luzon have not hitherto been examined, and it therefore remains quite uncertain from what species Sonnerat described. It is not improbable that he did so from an Indian example of *M. dukhunensis*.]

*M. DUKHUNENSIS*, Sykes.

Martaban. Karen-ni.

Both the last two species are cold weather visitors only.

*M. MELANOFF*, Pallas.

Arakan. Pegu. Tenasserim. Andamans.

*M. boursala*, Tem.



Lord Walden remarks, "Whether or not specifically distinct from *M. sulphurea* of Europe, this bird must take the title of *melanope*, Pallas."

CORYDALLA RICHARDI, Vieill.	Arakan. Karen-ni. Tenasserim.
C. EFFULA, Vieill.	Arakan. Pegu. Tenasserim.
C. MALAYENSIS, Eyton.	Southern Tenasserim.

A rare straggler from the south.

C. SERIOLATA, Blyth.	Southern Tenasserim.
----------------------	----------------------

A rare straggler from the south.

BUDYTES VIRIDIS, Gmel.	Europe. Asia. Africa. America.
<i>B. cinereicapilla</i> , Savi.	
<i>B. neglecta</i> , Jerdon.	
<i>B. flava</i> , Jerdon.	
<i>B. melanocephala</i> , Sykes.	
<i>B. dubius</i> , Hodg.	
<i>B. fulvirenter</i> , Hodg.	
<i>B. schisticeps</i> , Hodg.	

So widely spread a species is bound to exhibit numerous geographical variations (races), and we accordingly have (*vide* Brooke) *B. flava* over all the Old World and the northern half of the New. *B. cinereoccephala* and *B. melanocephala* over Eastern Europe, India and China.

Hodgson's species are of course Himalayan.

B. CALCARATUS, Hodg.	Palpooon.
LIMONIDROMUS INDICUS.	Arakan. Pegu. Tenasserim. China. Andamans.

#### *Pipits.*

PIRASTES MACULATUS, Hodg.	Arakan. Karen-ni up to 5000 feet. Tenasserim.
P. AGILIS, Sykes.	Pegu.
P. PLUMATUS, Müll.	Pegu.

Lord Walden remarks: "Some eminent ornithologists decline to admit the specific distinction of *A. agilis*, *A. maculatus*, and the common European Tree Pipit. In the H. List, No. 3640, L. S. Müller's title of *plumatus* is adopted for the European bird. But as Linnaeus published the twelfth edition of the Systema ten years before L. S. Müller bestowed the title cited, it is more in accordance with accepted practice to prefer the Linnaean title."

CORYDALLA RICHARDI, Vieill.	Andamans (Port Blair).
ANTHUS CERVINUS, Pall.	Tenasserim. Andamans. Nicobars.

#### Family **Ampelidæ.**

"In this, the last Dentirostral family, we have an assemblage of birds, considerably varied in their structure and colouration; but as a general rule of brighter and richer plumage than the majority of dentirostral birds."—Jerdon.

##### *Sub-family* LEIOTRICHINÆ.

This sub-family embraces the Blue Thrush-tits (*Cochoinæ*), the Hill-tits (*Leiotrichinæ*), and the Flower-peckers (*Leulinæ*).

COCHOA PURPUREA, Hodg.	Sikkim, 8000. Mooleyit over 5000.
PTERUTHIUS LERALEATUS, Tickell.	Mooleyit. Karen-ni at 4000 feet.
P. MELANOTIS, Hodg.	Tonng-ngoo ( <i>vide</i> Blyth).
P. INTERMEDIUS, Hume.	Mooleyit.

Hume questions if Blyth discriminated *melanotis* from *intermedius*, which is not impossible, if the one is (as is most probable) a mere local race of the other.

In describing *P. (Allotrius) intermedius*, Hume remarks: "I am afraid a great

many of my readers will abuse me heartily for making such a number of new species, differing only in small particulars from already well-known ones. . . . It is a most remarkable fact that the Avifauna of the Central Tenasserim Hills is specialized to a high degree. The question has not been half worked out yet, and still see what a list we already have of Tenasserim local representative forms."

## HIMALAYAN.

PALEORNIS SCHISTICEPS.  
 PICUS MACUL.  
 YUNGIPICUS PYGMAEUS.  
 GECINUS STROBILATUS.  
 GECINUS GRANTIA.  
 MEGALAIMA ASIATICA.  
 M. FRANKLINI.  
 ARACHNOTHERA MAGNA.  
 ÆTHOPYGA SCHERLE (miles).  
 Æ. SATURATA.  
 Sitta CINNAMOMIVENTRIS.  
 ANTHITES MONILIGER.  
 MYIOPHONUS TEMMINCKI.  
 HYDRORNIS NIPALENSIS.  
 ALCIPE NIPALENSIS.  
 STACHYRIS RUFICEPS.  
 S. CHRYSIA.  
 PELLORNEUM NIPALENSIS (Mandellii).  
 POMATORHINUS LEUCOGASTER.  
 GARRULUS LEUCOLPHUS.  
 TROCHALOPTERON CHRYSOPTERON.  
 ACTINODURA EGERTONI.  
 SIBIA CAPISTRATA.  
 HYPsipETES PSAROIDES.  
 H. MACCLELLANDI.  
 HEMIXUS FLAVULA.  
 CRINIGER FLAVEOLUS.  
 ORIOLES INDICES.  
 CRYPTOLOPIA BIRKII.  
 PTERUTHIUS ERYTHROPTERUS.  
 ALGOTRIUS MELANOTIS.  
 LEOPTILA ANNETANS.  
 SIVA STRIGULA.  
 S. CYANOPTERA.  
 MERULA RUFUGULARIS.  
 IXULUS RUFIGENIS, Hume.  
 GARRULUS BISPECTULARIS.  
 UROCISSA OCCIPITALIS.  
 CARPOPHAGA INSIGNIS.

## TENASSERIM.

P. FINSCHI, Hume.  
 P. ATRATUS, Blyth.  
 Y. CANICAPILLUS, Blyth.  
 G. VITATUS, Vieill.  
 G. VIRIDIS, Blyth.  
 M. DAVISONI, Hume.  
 M. RAMSAYI, Walden.  
 A. ACURATA, Blyth.  
 Æ. CARA, Hume.  
 Æ. SANGUINEPECTUS, Walden.  
 S. NEGLECTA, Walden.  
 A. SUBMONILIGER, Hume.  
 M. EUGENI, Hume.  
 H. OATESI, Hume.  
 A. PHAYREI, Blyth.  
 S. LUFFEBOUS, Hume.  
 S. ASSIMILIS, Walden.  
 P. MINOR, Hume.  
 P. OLIVACEUS, Blyth.  
 G. BELANGERI, Less.  
 T. MELANOSTIGMA, Tickell.  
 A. RAMSAYI, Walden.  
 S. MELANOLEUCA, Tickell.  
 H. SUBNIGER, Hume.  
 H. TICKELLI, Blyth.  
 { H. HILDEBRANDI, Hume.  
 { H. DAVISONI, Hume.  
 C. GRISEICEPS, Hume.  
 O. TENUIROSTRIS, Blyth.  
 C. TEPHROCEPHALA, Anderson.  
 P. ÆRALATUS, Tickell.  
 A. INTERMEDIUS, Hume.  
 L. DAVISONI, Hume.  
 S. CASTANICAUDA, Hume.  
 S. SORDIDA, Hume.  
 M. DUBIUS, Hume.  
 { I. STRIATUS, Blyth.  
 { I. HUMILIS, Hume.  
 G. LEUCOTIS, Hume.  
 U. MAGNIROSTRIS, Blyth.  
 C. GRISEICAPILLA, Walden.

These which now follow are all Himalayan birds, and their Burmese representative races.

## HIMALAYAN FORMS.

ASTUR RADIUS.  
 CARINE BRADMA.  
 THRIPOXOX HODGSONI.  
 PITTA CERULEA.  
 STURNOPASTOR CONTRA.  
 CORVUS IMPUDICUS, Hodg.  
 FRANCOLINUS CHINENSIS.

## BURMESE RACES.

A. POLIOPSIS, Hume.  
 C. PULCHRA, Hume.  
 I. CRAWFURDI, J. S. Gray.  
 P. DAVISONI, Hume.  
 S. SUPERCILIARIS, Blyth.  
 C. INSOLENS, Hume.  
 F. PHAYREI, Blyth.

CETIA NIPALENSIS, Hodg.	Karen-ni at 6000 feet.
SCIOPIA ANNECTANS, Blyth.	
<i>L. saturata</i> , Walden.	
<i>L. Davisoni</i> , Hume.	

Separated by Walden and Hume for its darker colouration, but a mere local race, no doubt of *L. annectans*, Blyth. Davison describes it as climbing about the trees and branches like a 'Nut-latch' (*Sitta*).

LEIOTHRIX ARGENTAURIS, Hodg.	Khasi Hills. Tenasserim. Karen-ni, 1500 to 4000 feet.
L. LUTEA, Scop.	Khasi Hills. Arakan. S.W. China.
SIVA STRIGULA, Hodg.	Toung-ngoo ( <i>vide</i> Walden).
L. CASTANEAUDA, Hume.	Mooleyit.

Hume supposes that *strigula* has been erroneously determined in place of the present, which is probable, for reasons given with regard to *Pteruthius intermedius*.

S. CYANOCROPTERA, Hodg.	Khasi Hills. Tenasserim.
S. SORDIDA, Hume.	Mooleyit.

The above remarks apply, *mutatis mutandis*, to these two species also. A local race is pretty sure to figure as a new species in Mr. Hume's hands.

MERULA CASTANEICEPS, Hodg.	Karen-ni. Mooleyit above 2000 feet.
M. RUBRA, Hume.	Pine forests of Palpoon.
<i>Proparus dubius</i> , Hume.	
M. MANDELLI, God.-Aust.	Shillong. Assam.

Godwin-Austen regards these as representative races. Hume dissents. Probability leans to the former view, but "non nostrum tantas."

#### IXULINÆ.

IXULUS STRIATUS, Blyth.	10 miles from Mooleyit at 3000.
-------------------------	---------------------------------

This species, Hume remarks, was not rediscovered, but Davison obtained a "nearly allied" form.

I. HUMILIS, Hume (?).	Mooleyit, at 6000 feet.
-----------------------	-------------------------

As the type of *striatus* is 'unique,' it is uncertain how far these 'allied' species may be really distinct.

YUHINA GULANIS, Hodg.	Arakan.
EEPORINIS XANTHOLEUCA, Hodg.	Khasi Hills. Arakan. Pegu. Tenasserim.
<i>E. xanthochlora</i> , Hodg. (S.F. iii. p. 142).	

This is an aberrant form, which Bonaparte places in the *Pycnonotinæ*. In colouration and bill it is related to *Zosterops*, by its head feathers to *Myzornis*, and it has also some affinity to *Iora* (Jerdon).

ZOSTEROPS PALPEBROSUS, Tem.	Arakan. Pegu. Tenasserim. Nicobars.
Z. SIAMENSIS, Blyth.	Martaban. Mooleyit.
Z. AUSTENI, Walden.	Karen-ni at 2500.
Z. NICOBARIENSIS, Blyth.	Andamans. Nicobars.

#### Sub-family PARINÆ.

This sub-family embraces the Titmice, a strongly-marked group of small non-migratory birds, some of which exhibit an affinity to the *Conirostres* in their thick muscular stomach, etc. Their colours are pleasingly blended with blue, green and yellow, and many are crested. They are arboreal and omnivorous, very bold, and will even destroy young or sickly birds. They build in holes of trees or in walls, and a few make pendulous nests. The eggs are white, with red spots.

ÆGITHALISCUS ERYTHROCEPHALUS, Vig.	Karen-ni, at 3000 feet.
MACLOPHUS SPILONOTUS, Blyth.	Karen-ni, at 3500.
M. SUBVIRIDIS, Tickell.	Tenasserim, at 3500.

Lord Walden remarks: "This must still continue a doubtful species. It was founded on a single example, shot at an elevation of 3500 feet in the Tenasserim Hills by Col. Tickell. A second individual (much injured) from Tenasserim was identified with it by Mr. Blyth four years later. Both appear to have been examples of *M. spilomolus* in immature plumage."

*PARUS CLSIUS*, Tickell.

Pegu.

A rare straggler in Burma.

*P. COMMITTUS*, Swinhoe.

Karen-ni, at 3000 feet.

*MELANOCHLORA SULTANEA*, Hodg.

Arakan. Martaban. Tenasserim.

*H. flavicristata*, Lafresn.

#### Family Diceruridæ.

The drongo shrikes or King-crows are birds of black plumage and ten tail feathers only. They are capable of rapid but not sustained flight, and are wholly insectivorous. They build a loose nest, and lay white eggs, spotted with dark red.

#### DICERURINÆ.

*BUCHANGA ATRA*, Herm.

Arakan. Pegu. Tenasserim.

*B. ANNECTANS*, Hodg.

Nipal. Pegu. Tenasserim.

*B. BALICASSIUS*, L.

Burma. Nicobars.

*B. LONGICAUDATA*, Hay.

Nipal. Bengal. Pegu. Tenasserim.

*B. pyrhopus*, Hodg.

*B. intermedia*, Blyth (apud Hume nec Sharpe).

*B. Waldeni*, Beavan.

*B. himalayensis*, Tytler (S.F. vi. 213-215).

*B. LEUCOPHLEA*, Vieill.

Pegu. Tenasserim. Andamans.

*B. Mouhoti*, Walden (monente auctore, B.B. p. 130).

*B. intermedia*, Blyth (apud Walden nec Hume).

*B. MACROCERCUS*, Vieill.

Pegu.

*D. Indicus*, Hodg.

*D. albirictus*, Hodg.

Hume gives this species from Pegu (S.F. iii. p. 101), but it does not appear in Blyth's list (B.B.).

*B. LEUCOGENYS*, Wald.

South Tenasserim.

The King-crow may often be seen hawking for insects of an evening, and generally returning to the same perch after capturing one, and in common with many other birds, hawks, kites, crows, mainahs, etc., they will assemble from all parts, as soon as aware of a swarm of white ants being on the wing. In the forest these insects often rise in winged swarms like a column of smoke; but as soon as they clear the tree tops, the column is broken and disintegrated by the ceaseless dash of birds at the luscious prey, and when too dark for them, their place is taken by bats. They are called King-crows from attacking crows or other birds which approach their nest. Jordon describes the cry as harsh, but cheerful, and as often maintained during the greater part of a moonlight night, and the earliest harbinger of the coming dawn.

*CHAPTIA LENEA*, Vieill.

Arakan. Tenasserim north of Mergui.

*C. MALAYENSIS*, Blyth.

Tenasserim south of Tavoy.

From Hume's observations (S.F. vi. p. 218) it would seem that these are respectively Northern and Southern races of one species which meet about Tavoy, where intermediate forms are common.

The genus *Bhringa* is characterized by the base of the bill being shaded by recurved feathers and the outer tail feathers being elongated during the breeding season, with the tip barbed on both sides for over 3 inches, forming a racket-tail. Tail nearly even.

*BHRINGA REMIFER*, Tem.

Arakan. Pegu. Tenasserim.

*B. TECTIROSTRIS*, Hodgs.

Sikkim. Pegu.

In *Dissemurus* the frontal plumes curve back over the forehead, forming a fine crest, and the 'racket' feathers of the tail have the inner web narrower than the outer.

*DISSEMERUS PARADISEUS*, L.

Arakan. Pegu. Tenasserim.

*D. Rangoonensis*, Gould.

*D. MALABAROIDES*, Hodg.

Nipal. Arakan. Pegu.

Oates describes this bird as having a magnificent voice and a song very rich and powerful. Blyth's remarks on this species may here be quoted:

"I provisionally bring together the various races of *Bhimráj* (as they are designated in Bengal), because it appears to me that their differentiation is not yet sufficiently understood; but specimens from different localities differ much in size and in the development of the frontal crest. In some the latter is rudimentary, if it exist at all; while in others it attains a length of 2½ in., the frontal plumes flowing over and beyond the occiput. The ordinary length in Burmese specimens is about 1½ in. In one specimen in the Calcutta Museum, which is believed to have been procured by Heltzer, the frontal crest is rudimentary, whilst the racket tail-feathers attain very unusual length, the unwebbed portion of them being much more spirated than I have seen in any other. Again, there is one race, found especially in Tippera, with the frontal crest 2½ in. long, and the closed wing 6¾ in. But, with the exception perhaps of this Tippera bird, there would seem to be all possible gradations in different localities, especially as regards the development of the frontal crest. The longest crested (or Tippera form) is styled *Chibia malabaroides* by Mr. Hodgson, and the *Edolius grandis*, Gould, is described to have the crest 1½ in. in length. *E. paradiseus* (*Cuculus paradiseus*, L.) is based on Brisson's *Cuculus cristatus siamensis*, founded on a drawing by Poivre of a Siamese specimen, and should therefore denote the ordinary Tenasserim bird, which is identical with the *Bhimráj* of the Calcutta bird-dealers. As observed in captivity, this species has astonishing powers of mimicry. I had one which imitated the fine song of the Sháma (*Cittocincla macroura*) to perfection; also the crowing of cocks, and every other sound produced by domestic poultry, the cawing of crows, the notes of various other wild birds, the bleating of calves, the cry of a dog being whipped, mewing of cats, etc.; but I do not remember to have heard one sing in the wild state. Mason, however, mentions its loud, flute-like notes, and remarks of one that used to come at sunset every evening, and perch on a bough near his dwelling in Dong-yan; 'there it would sit and pour forth an incessant strain of melody for half an hour at a time.' As seen alive, it presents a very different appearance from the stuffed specimens exhibited in museums, the hackled feathers of the neck showing to advantage. When tamed it is very fearless and familiar, and may be suffered to have its liberty in country places. It preys with avidity on small birds and other animals. But with all its extraordinary faculty of imitating sounds, the *Bhimráj* never attempts to articulate human speech, in which some examples of the hill maina (*Eulabes*) succeed so admirably."

*D. AFFINIS*, Tytler.

Andamans. Nicobars.

The next genus differs from *Dissemurus* in wanting a crest, and in the outer tail feathers being only slightly lengthened and no portion of the shaft bare.

*DISSEMUROIDES DICRURIFORMIS*, Hume.

Great Coco and Turtle Island.

*D. ANDAMANENSIS*, Tytler.

Andamans.

In the next genus a crest of hairs rises from the forehead, and falls down over the neck. The tail is forked and the outer tail feathers slightly lengthened and turned up into a sort of scoop.

*CHIBIA HOTTENTOTA*, L.

Arakan. Pegu. Tenasserim.

This bird goes about in small parties, frequenting cotton trees in blossom for the insects which shelter in the larger calices. Jerdon describes its voice as "changeable and in constant exertion, from a beautiful song, to whistling chattering, and like a rusty wheel, at times resembling the higher strains of the organ, both striking and plaintive."

## ARTAMINÆ.

A single species only of the swallow shrikes occurs in Hindostan, though they are more numerous in Australia. Some of the Australian species, says Jerdon, have a remarkable habit of clustering like bees.

ARTAMUS FUSCUS, Vieill. Arakan. Pegu. Tenasserim.

This species, remarks Hume, is a rare straggler in Tenasserim.

A. LEUCORHYNCHUS, L. Andamans.

## Family Laniidæ.

The typical shrikes are birds of moderate size, feeding mainly on insects, and even small birds and mammals, which they sometimes impale on thorns.

LANIUS TEPHRONOTUS, Vigors. Arakan. Pegu.

A rare straggler in Pegu and Tenasserim.

L. NIGRICEPS, Frank. Arakan. Toung-ngoo. Pahpoon.

L. CRISTATUS, L. Arakan. Pegu. Tenasserim. Andamans.

L. COLLUROIDES, Less. Pegu. Martaban. Tenasserim.

A cold weather visitant.

L. MAGNIROSTRIS, Less. Southern Tenasserim.

A rare straggler in Tenasserim from the Malayan Peninsula, where it is plentiful.

L. HYPOLEUCOS, Blyth. Pegu.

This, says Oates, is the only common shrike in Pegu.

L. LUCIONENSIS, L. Southern Tenasserim. Andamans.

A rare straggler in Tenasserim, common at Port Blair.

TEPHRODORNIS PELVICA, Hodg. Arakan. Pegu. Tenasserim.

T. PONTICERIANA, Gmel. Pegu.

LALAGE TERAT, Bodd. Nicobars.

HYLOTERPE GRISOLA, Blyth. Andamans.

*Hyloterpe philomela*, Boie.

*Hylocharis occipitalis*, Hume.

H. CYANEA, Hume. Tavoy. Mectan.

A rare straggler into Southern Tenasserim, probably from Siam.

HEMIPUS PICATUS, Sykes. Pegu. Toung-ngoo. Pahpoon.

H. CAPITALIS, MacClell. Assam. Naga Hills. Darjiling.

This species is separated by Blyth and Walden, but Hume suggests if it is anything else than the last, of which the males sometimes retain the brown back of *capitalis* in place of the normal black one.

H. OBSCURUS, Horsf. Mergui (where very rare).

## CAMPEPHAGINÆ.

VOLVOCIVORA AVENSIS, Blyth. Pegu. Tenasserim.

V. INTERMEDIA, Hume. Tenasserim north of Mergui.

V. NEGLECTA, Hume. Tenasserim south of Mergui.

These two species are the local representatives of each other.

V. SYKESII, Strickland. Upper Pegu.

V. MELANOSCHISTUS, Hodg. Martaban. Tenasserim.

GRAUCALUS MACUL, Less. Arakan. Pegu. Tenasserim.

G. DOBSONI, Ball. Andamans.

The next species to be named are the Red shrikes or *Minivets*. They are lively birds, moving about in small parties, and usually keeping up a continual chirping.

PERICROTIS SPECIOSUS, Lath.	Arakan. Tenasserim.
Huet-men-thā ♂. Huet-men-thamie ♀.	
P. BREVIROSTRIS, Vig.	Karen-ni at 3000. Palpooon.
P. ROSIER, Vieill.	Arakan. Pegu. Palpooon.
P. PEREGRINUS, L.	Arakan. Pegu. Tenasserim. Andamans.
P. ALBIFRONS, Jerdon.	Pegu. Toung-ngoo.
P. ELEGANS, MacClell.	Martaban. Karen-ni. Tenasserim.
P. ANDAMANENSIS, Tytler.	Andamans.
P. IGNEUS, Blyth.	Pakehan. Southern Tenasserim.
P. NEGLECTUS, Hume.	Mooleyit.
P. FLAMMIFER, Hume.	Pakehan.
P. SOLARIS, Blyth.	Mooleyit and Thatone.
P. CINEREUS.	Southern Tenasserim.

### Family Muscicapidæ.

The flycatchers are a group of insectivorous birds of small size, with a wide gape and usually strong rictal bristles, which enable them the more readily to retain winged insects, on which they mainly feed. Their wings are not adapted for long flight, but they can make rapid and powerful sallies after their insect prey.

#### MYIAGRINÆ.

MUSCIPETA PARADISI, L.	Arakan. Pegu. Tenasserim.
<i>M. affinis</i> , A. Hay.	Andamans. Nicobars.

The paradise Flycatcher.

The changes of colour in this bird are very striking. In the second year the prevailing hue of the body is chestnut, but the nuptial plumage in the third year is white. The head in either case is black. The adult females resemble the males, but want the elongated tail feathers. It is restless and wandering in its habits, and the undulatory movement of its long tail in flying is very peculiar.

The Burmese race is regarded as distinct by Jerdon and Blyth, but Hume, with fuller materials, arrives at an opposite conclusion. The point is, not that extreme examples of either race would not be justly held to constitute distinct species did no intermediate links occur, but that in the presence of numerous intermediate forms, they cannot be held to do so. These intermediate forms not clearly referable to either species, but having relations to both, constitute the umbilical cord which binds a *race* to a *species*. Let natural causes sever this cord, and a new species is thereby produced (S.F. iii. p. 102). Subsequently (S.F. vi. p. 223) Mr. Hume accepts *affinis* as the Burmese species, but adds nothing to detract from the force of the reasons which he previously gave for an opposite conclusion. It of course matters little whether a distinction is treated as specific, or sub-specific (*i.e.* racial), but it is clearly desirable, when we can do so, to restrict the swarms of shadowy species with which zoological literature is afflicted.

PHILENTOMA PYRRHOPTERUM, Tem.	Southern Tenasserim.
P. VELATUM, Tem.	Martaban. Tenasserim.
HYPOTHYMIS AZUREA, Bodd.	Arakan. Pegu. Tenasserim. Nicobars.

Common throughout the country. It is solitary in its habits, and spreads out its tail in a fan, like the species of *Leucocerca* or 'Fantails.' This species is replaced at the Andamans by the next, which is however merely a local race.

<i>H. Tytleri</i> , Beavan.	Andamans.
LEUCOCERCA ALBICOLLIS, Vieill.	Tenasserim Hills, from 2000 to 6000 feet.
L. ALBIFRONTATA, Frank.	Pegu. Tenasserim.
<i>L. aurcola</i> , Less.	
L. JAVANICA, Sperrin.	Tenasserim south of Tavoy.
<i>L. infumata</i> , Hume.	

This species affects the maritime region, and is especially fond of *Mangrove* and *Nipa* swamps (Davison).

The 'fantails' are active little birds ever on the move, from branch to branch, snapping up small insects, and rapidly opening and closing the tail, like a fan, and trailing the wings. They make a neat cup-shaped nest in a fork of bamboo, and lay white eggs, spotted with reddish-brown.

<i>CHLIDORHYNX HYPOXANTHA</i> , Blyth.	Nipal. Sikkim. Young-ngoo.
<i>CULICAPPA CYLONENSIS</i> , Swains.	Pegu. Tenasserim.
<i>Cryptolopha cinerocapilla</i> , Vieill.	

#### MUSCICAPINÆ.

The birds of this division show a tendency towards the *Saricoline*, in the spotted plumage of their young, but their habits are more those of *Flycatchers* than *Stonechats*, who rarely capture insects except on the ground.

<i>HEMICHOLIDON SIBIRICUS</i> , Gmel.	Arakan. Pegu. Tenasserim.
<i>H. fuliginosa</i> , Hodg.	

There is some doubt as to the correct synonymy of this species, but the Pegu bird is the same as that figured as *fuliginosa* by Hume (Lahore to Yarkand, pl. 4). S.F. ii. p. 220; iii. p. 104; vi. p. 226.

<i>ALCEDONAX LATHROSTRIS</i> , Rafll.	Arakan. Pegu. Tenasserim. Andamans.
<i>A. FLAVIGINEUS</i> , Hodg.	Sikkim. Pegu. South China.
<i>Buteo rufescens</i> , Jerdon.	
<i>STOPAROLA MELANOPS</i> , Vig.	Arakan. Pegu. Tenasserim. Karen-ni, to 5000.

A cold weather visitant in Burma, disappearing after February (Davison).

<i>CYORNIS RUBECULOIDES</i> , Vig.	Arakan. Pegu. Tenasserim.
------------------------------------	---------------------------

This is a species which appears to run into and merge in *C. elegans*, Tem., from Sumatra. Certainly, according to Hume, Tenasserim birds differ slightly in colouration from India, and approach the Sumatra race, and the present seems one of those instances where an increase of our knowledge leads to the union more or less complete of species from widely-separated localities.

<i>C. OLIVACEA</i> , Hume.	Southern Tenasserim.
----------------------------	----------------------

Separated from its allies by the proportions of its bill, and the similarity in colouring of the sexes (S.F. v. p. 338).

<i>C. MAGNIROSTRIS</i> , Blyth.	Southern Tenasserim.
<i>C. VIVIDA</i> , Swinh.	Mooleyit.
<i>C. BANYANAS</i> , Horsf.	Karen-ni.
<i>C. Tickellie</i> , Blyth, <i>apud</i> Walden.	

Lord Walden in B. B. quotes the above Nos. of Jerdon, 305, 306, giving both name and reference incorrectly. I presume, however, it is his opinion that these two species should be united, in which case, of course Blyth's species must give way. Hume includes neither species among Tenasserim birds, and considers the identification of the Karen-ni bird to involve some error. Hume also gives the name incorrectly (*Tickelli*). S.F. vi. p. 229.

<i>NILTAVA SUNDARA</i> , Hodg.	Arakan and Tenasserim.
--------------------------------	------------------------

Both Blyth and Lord Walden record this bird from Burma, but Hume ventures a suggestion if *Cyornis vivida* was not mistaken for it. The suggestion is improbable, but may be noted.

<i>N. MACGREGORIE</i> , Barton.	Martaban. Karen-ni at 3000.
<i>N. GRANDIS</i> , Blyth.	Mooleyit.
<i>A. MONILIGER</i> , Hodg.	Arakan. Tenasserim. Karen-ni at 5000.
<i>A. sub-moniliger</i> , Hume.	

The Burmese race has been separated by Hume (S.F. v. p. 105), but its author



describes the one as the representative of the other, and such representative races are best kept united as such without actual specific rank.

*SIPHIA STROPHATA*, Hodg. Arakan. Tenasserim.  
*S. LETHYCA*, Blyth and Jerdon. Palpooon pine forests. Karen-ni at 4000 feet.  
*ERYTHROSTERNA ALBICILLA*, Pall. Sikkim. Pegu. Martaban. Tenasserim.

*E. leucura*, Gmel.  
*E. ACORNANS*, Hodg. Martaban and Karen-ni at 2500.

Blyth and Walden both give this bird a habitation in Burma, while Hume and Brooks (S.F. v. p. 471) seem to question its existence as a separate species.

*E. MACULATA*, Tickell. Mooleyit at 5000. Karen-ni at 3000 feet.  
*E. pusilla*, Blyth ♀.

#### CONIROSTRES.

Bill short, stout, conical. Mostly small-sized granivorous birds. Some of them are very sweet singers.

#### Family **Fringillidæ.**

The finches are divided by Jerdon into the following sub-families: *Ploceinae* or Weaver birds; *Estreldinae* or Amakavats or Avakavats (a barbarous attempt to convey the name of the mart, Ahmedabad, whence they were originally imported to Europe); *Passerinae* or Sparrows; *Emberizinae* or Buntings; *Fringillinae* or Finches; and *Alaudinae* or Larks.

#### PLOCEINÆ.

*PLOCEUS JAVANENSIS*, Less. Pegu. Siam.  
*P. MANYAR*, Horsf.  
*P. striatus*, Blyth. Arakan. Pegu. Siam.  
*P. BENGALENSIS*, L. Pegu. Ava.  
*P. BAYA*, Blyth. Arakan. Pegu. Philippines.  
*P. HYPOXANTHUS*, Daud. Pegu.

The nest of the *bayas* is a compact retort-shaped structure of interwoven strips of grass, fixed pendant to the fronds of some tall palm or other trees (I can't help it if people will see a pun),<sup>1</sup> or sometimes, as at Rangoon, to the eaves of houses. It is too well known to need description, but one curious point connected with the little dabs of clay fixed on either side of the perch, is the extravagantly foolish reasons which have been assigned by able naturalists to account for their presence. Layard suggests that the birds may clean their bills on them. Burgess that they strengthen the nest, which, considering the nest is so firm a structure as to tax a strong man to rend it asunder, is little less than preposterous; and Jerdon, that it helps to balance the nest, and prevent its being blown about, which seems to me no less extravagant. I would suggest its being the survival of some trait of a remote ancestor, when the habit, indulged in to a greater degree, may have possessed a function and use which the present dab of clay now no longer fulfils. For a full account of the interesting habits of this clever and docile bird reference may be made to Jerdon's 'Birds,' vol. ii. p. 343.

#### ESTRELDINÆ.

*MUNIA RUBRINIGRA*, Hodg. Arakan. Pegu. Tenasserim.

Lord Walden remarks: "Bornean specimens are similar to Indian and Burmese, having the black of the abdominal region and lower tail-coverts well developed; but this black is much reduced in quantity, and sometimes nearly obsolete, in examples from Malacca and Sumatra. In the race inhabiting Celebes (*M. brunneiiceps*, Walden), the black beneath is well developed, while that on the head and neck is much embrowned. The race with white underparts, having the black abdominal patch and lower tail-coverts (Edwards, pl. 355), has never been observed eastward of the Bay of Bengal, but occurs rarely in Lower Bengal, and prevalently (if not wholly)

<sup>1</sup> The *Burassus* is the 'Tāl' palm of Bengal.

in South India and Ceylon. *M. formosana*, Swinhoe, is yet another of these very slightly differing races, for which names are barely admissible."

<i>M. punctulata</i> , L.	Arakan. Pegu. Tenasserim.
<i>M. punctularia</i> , Pearson.	
<i>M. subundulata</i> , Godl.-Aust.	
<i>M. superstriata</i> , Hume.	

Mr. Blyth, speaking of this Pegu bird, says: "The true Indian race, as distinguished from the kindred *M. niseria*, Tem., which inhabits the Malayan peninsula, and has ash-coloured upper tail coverts," and Mr. Blyth's opinion has some weight. The bird, however, falls into Mr. Hume's clutches and at once receives a name, and if we may credit Lord Walden, another as well from Godwin-Austin. To this Hume rejoins that *his* bird is smaller, and so the efforts to create species out of local races goes merrily on.

<i>M. striata</i> , L.	Andamans. Nicobars.
<i>M. non-striata</i> , Hume.	
<i>M. semistriata</i> , Hume.	

Mr. Hume (S.F. ii. p. 275) at the top of the page (i.e.) says, "*I do not separate specifically the Andaman and Nicobar Munias;*" but before he gets to the bottom of it, the flesh is too powerful for the spirit, and the above names are proposed for the races inhabiting the Andamans and Nicobars respectively!

<i>M. atricapilla</i> Vieill.	Pegu ( <i>vide</i> Oates).
<i>M. acuticauda</i> , Hodg.	Arakan. Pegu. Tenasserim. Siam.

The white-rumped or common Munia of Tenasserim.

<i>M. leucogaster</i> , Blyth.	Southern Tenasserim.
<i>M. leucogota</i> , Tem.	Arakan.
<i>ESTRELLA AMANDAVA</i> , L.	All India. Assam and Burma.
<i>E. flaviventris</i> , Wallace.	Karen-ni and between the Salween
<i>E. Burmanica</i> , Hume.	and Sittoung Rivers.
<i>ERYTHRURA PRASINA</i> , Sparr.	Southern Tenasserim.

A winter visitant from the south.

Birds of these last two sub-families have the first primary minute, and lay white eggs. The members of the next sub-family lay spotted eggs, and construct clumsy bulky nests in trees and holes.

#### PASSERINÆ.

<i>PASSER INDICUS</i> , Jerd. and Selb.	Akyab and Thayet-myo.
<i>P. FLAVOLUS</i> , Blyth.	Karen-ni. Upper Pegu.
<i>P. assimilis</i> , Walden.	Toung-ngoo.

Hume is inclined to refer this to the last, of which it is probably a race. (S.F. vi. p. 407).

<i>P. MONTANUS</i> , L.
-------------------------

The common house Sparrow everywhere to the eastward of the Bay of Bengal, its range extending southward to the Malay countries, and eastward to China and Japan, Formosa, and the Philippines (Blyth).

#### EMBERIZINÆ.

The Buntings form a considerable group of birds distributed in all parts of the world save Australia. They are terrestrial in their habits, and construct neat cup-shaped nests on the ground or in low bushes, and lay coloured eggs, peculiarly lined and spotted. They are poorly represented in India.

<i>EMBERIZA FUCATA</i> , Pall.	Toung-ngoo. Thayet-myo.
--------------------------------	-------------------------

A winter visitant only.

- E. PSILLA, Pall. Karen-ni at 5500 feet. Mooleyit.  
 E. RUTHA, Pall. Sikkim. Bassein in Pegu. Young-ngoo.  
 Karen-ni. Patipoon.  
 A winter visitant only.  
 EUSPIZA AUREOLA, Pall. Arakan. Pegu. Tenasserim. Nicobars.  
*E. flavogularis*, Blyth.  
*Micrafra flavicollis*, MacClell. ♀ (*vide* Walden).  
 MELOPHUS MELANICTERUS, Gmel. Karen-ni. Martaban.

#### FRINGILLINÆ.

In the finches the males are usually far more brightly coloured than the females. Their food is chiefly seeds. They build neat nests in trees and bushes, and lay white or coloured eggs spotted, but never 'lined,' like the buntings. They are birds of temperate climes.

- CARPODACUS ERYTHRINUS, Pall. Arakan. Young-ngoo.

#### ALAUDINÆ.

The larks are birds of robust form and terrestrial habits, but with broad wings fitted to enable them to soar, as is the custom of many species. They feed on grain and insects, dust themselves with sand, like the *Gallinacea*, and lay their eggs on the ground, the eggs being of a dusky or greenish hue, profusely speckled.

The 'Ortolan,' as it is called in India, *Calandrella brachydactyla*, Tem., belongs to this subfamily and visits India in immense flocks, and is then very fat, and Jerdon records bagging (besides those that escaped) twelve dozen birds at Kampte by a right and left shot.

- MIMASTA AFFINIS, Jerdon. Pegu.  
*M. microptera*, Hume.

Considering that Jerdon describes finding this his own species abundantly at Thayet-myo, it seems highly unnecessary to have a second name bestowed on the same bird.

- M. ASSAMICA, MacClell. Arakan.  
 ALAUDULA RAYTAL, Blyth. Pegu.  
 ALAUDA GULGULA, Franklin. Martaban. Arakan.

This is the 'Sky-lark' of India, and its voice and mode of singing closely resemble that of the European bird.

#### Family Sturnidæ.

This family embraces the Starlings and Mynahs. Some breed in holes of trees or buildings, or in banks, others make large nests in trees, and all lay spotless eggs of a bluish-green, either pale or deep in tint.

#### STURNINÆ.

- STURNOPASTOR CONTRA, L. Pegu. Tenasserim north of Mergui.  
*S. superciliaris*, Blyth (monente auctore).  
 S. NIGRICOLLIS, Paykull. Blamo. Lower Siam.  
 ACRIDOTHERES TRISTIS, L. Arakan. Pegu. Tenasserim.  
 A. GINGINIANUS, Lath. Tenasserim.  
 A. FUSCUS, Wagl. Arakan. Pegu. Tenasserim.  
*A. griseus*, apud Blyth.

According to Davison, the irides are yellow, whilst the closely affined *A. Mah-rattenensis*, Sykes, has them pale blue.

- A. SIAMENSIS, Swinhoe. Karen-ni at 3000.  
 Irides pale chocolate.

PASTOR ROSEUS, L.

Andamans.

An occasional visitant (*vide* Tytler).

Sturnia MALABARICA.

Arakan. Pegu. Tenasserim.

S. NIMERICOLA, Jerdon.

Pegu. Toung-ngoo.

*Timonachus leucopterus*, Hume.*S. Blythii*, Jerdon.

This species, according to Walden, replaces the last in Upper Pegu.

S. PAGODARUM, Gmel.

Arakan (rare).

S. ANDAMANENSIS, Tytler.

Andamans. Nicobars.

S. ERYTHROPYGIA, Blyth.

Car Nicobar.

S. BURMANICA, Jerdon.

Toung-ngoo. Karen-ni.

S. SUTENINA, Pall.

Martaban. Tenasserim. Andamans. Nicobars.

*Pastor dauricus*, Gmel.

A rare cold weather visitant.

S. SINENSIS, Gmel.

(Said to winter in Pegu.)

SARAGLOSSA PHILOPTERA, Vig.

Toung-ngoo. Karen Hills at 2000 ft.

CALORNIS AFFINIS, Hay.

Tippura. Arakan. Nicobars.

C. CHALYBEUS, Horsf.

Tenasserim.

C. TYTLERI, Hume.

Andamans. Nicobars.

## EULABINÆ.

EULABES JAVANENSIS, Osbeck.

Sikkim. Pegu. Tenasserim. Java.

*E. intermedia*, Hay.

Andamans. Nicobars.

*E. Andamanensis*, Tytler.

According to Lord Walden, there are two species or races of Eulabes in Sumatra, specimens from the south-east of the island being identical with those from East Java, whilst specimens from the north-west of Sumatra agree with those from Singapore and Malacca. Hume adds, "But I have reason for supposing that possibly a break in the fauna occurs across Sumatra, just as it does across Tenasserim, between Tavoy and Mergui, and that while many species remain unchanged, throughout the whole length of the island, of others two distinct forms occur, the one to the west and the other to the east, the westward one is such cases being identical with that of the Malayan Peninsula, and the eastern with those of Java and Borneo." Hume describes this species as gradually decreasing in size as you recede from the Straits to Sikkim throughout the length of Tenasserim, Pegu and Arakan, and the decrease in size continues if you double back south across the continental area to Sumbalpur and the tributary Mehals. This remark refers to the birds as a whole, and individual cases excepted. In no other respect do the birds differ save in size, and the dwindling of this Malayan form in the uncongenial area of continental India is a curious and significant fact in the distribution of animals, and testifies to the potency of those unseen and inappreciable laws which regulate the origin and spread of species. The Andaman and Nicobar races are differentiated by trifling but fairly constant proportions of the bill as contrasted with Malayan and Indian examples (S.F. vi. p. 396).

AMPELICEPS CORONATUS, Blyth.

Toung-ngoo. Tenasserim. Cochin-China.

## Family Corvidæ.

Bill strong, entire, rarely notched. Nostrils thickly shaded by stiff incumbent bristles. Feet strong. Birds mostly of large size. Omnivorous.

## DENDROCITTINÆ.

DENDROCITTA Rufa, Scop.

Arakan. Pegu. Tenasserim north of Mergui.

The common Indian magpie.

D. HIMALAYENSIS, Blyth. Palpooon. Karen-ni.

*D. assimilis*, Hume (monete anctore, S.F. vi. p. 386).

D. BAYLEY, Tytler. Andamans.

This handsome magpie is intermediate between *Dendrocitta* and *Crypsirina* (S.F. vi. p. 245).

CRYPsirina varians, Lath.

Pegu. Tenasserim. Java.

C. cUCULLATA, Jerdon.

Pegu and Upper Burma.

PLATYSMURUS LEUCOPTERUS, Tem.

Tenasserim south of Mergui.

#### GARRULINÆ.

Cissa speciosa, Shraw.

Assam. Arakan. Pegu. Tenasserim

*C. sinensis*, Brisson.

north of Mergui.

Blyth describes this species as tame, fearless, and amusing, highly carnivorous, and possessing the shrike-like habit of placing a bit of food between the bars of their cage. Buchanan Hamilton says it can be trained to kill small birds, like a hawk.

C. MAGNIROSTRIS, Blyth.

Arakan. Pegu. Tenasserim.

It is questionable if this is more than a local race of the preceding bird, or even if it is distinguished, save by peculiarities which are those of individuals rather than a race.

GARRULUS LEUCOTIS, Hume.

Toung-ngoo and Northern Tenasserim.

#### CORVINÆ.

PLATYLOPHUS ARDESIACUS, Cab.

Tenasserim.

CORVUS SPLENDENS, Vieill.

Arakan. Pegu and Tenasserim north of Mergui.

*C. impudicus*, Hodg.

*C. insolens*, Hume.

The dark or melanoid race, with the grey of the neck replaced by black. The habits of the Indian crow are too well known to require description. Jerdon gives a good description of this bird, and says he has been struck on the head by it for carrying off a young bird which had fallen from the nest. The very same thing happened to myself in Calcutta. I had gone to the assistance of a young bird which had fallen from its nest, but my motives being mistaken, I was attacked by the parents, severely pecked and clawed on my bare head, and, worst of all, served by them as Gulliver was served under the tree by the Yahoos. Fact! After that I abandoned the young bird to its natural guardians, whilst I retired to clean myself.

C. VAILLANTI, Less.

Arakan. Pegu. Tenasserim. Andamans.

The Indian raven.

#### Order COLUMBÆ.

This order is extremely well defined, and a pigeon or dove is seen to be such at a glance. To this order, however, belonged the extinct dodo, which as an aberrant form, and by no means like our ordinary conception of a pigeon, incapable as it was of flight. Pigeons are monogamous and pair for life. They lay two white eggs (*Calenas* one only), and either form a loose nest of sticks in trees, through which the eggs may sometimes be seen, or lay in holes of rocks and buildings.

#### Family Treronidæ.

This family is divided into three sub-families: *Treroniæ*, green pigeons; *Carpophagiæ*, imperial pigeons; and *Ptilopodiæ*, green doves.

#### TRERONINÆ.

TRERON NIPALENSIS, Hodg.

Arakan. Pegu. Tenasserim.

CROCOPUS PILICOPPERUS, Latham.

Pegu. Tenasserim.

*C. viridifrons*, Blyth.

Blyth remarks that this race is barely separable from *phanicopterus*, save that its colours are purer and more contrasted.

<i>OSMOTREXON PHAYREI</i> , Blyth.	Arakan. Pegu. Tenasserim.
<i>O. BRINCA</i> , Jerdon.	Arakan. Pegu. Tenasserim.
<i>O. AFRANS</i> , L.	Southern Tenasserim.
<i>O. CHLOROPHTERA</i> , Blyth.	Andamans. Nicobars.
<i>O. FULVICOLLIS</i> , Wagl.	Southern Tenasserim.

Hume gives a key to the different species of *Osmotrexon*, in S.F. iii. p. 162, and S.F. vi. p. 414, and remarks that the males of the different species differ far more among themselves than the females do.

<i>SPHENOCERCUS SPHENURUS</i> , Vig.	Toung-ngoo. Martaban. Palpoo.
<i>S. APICATUS</i> , Hodg.	Toung-ngoo. Palpoo.

#### CARPOPHAGINÆ.

<i>CARPOPHAGA LEXA</i> , L.	Arakan. Pegu. Tenasserim. Andamans.
-----------------------------	-------------------------------------

The imperial pigeon feeds largely on the wild nutmeg, the envelope of which or 'mace' is digested, and the 'nutmeg' then rejected. The bird always selects the finest and ripest fruit, and the seeds it has swallowed are consequently sought for and used for sowing. The same happens with coffee berries which have been eaten by jackals, and which, after passing through their bowels, are collected, and exported to Europe, where they help to make the 'finest Mocha' (*vide* S.F. ii. p. 261).

<i>C. INSULARIS</i> , Blyth.	Nicobars.
------------------------------	-----------

This is the imperial pigeon of the Nicobars. It is a larger bird than the last, and the green of its plumage is darker and bluer. This *Carpophaga* lays a single egg only, as a rule, and *bicolor* likewise.

<i>C. PALMBODES</i> , Hume.	Andamans. Nicobars.
<i>C. INSIGNIS</i> , Hodg.	Arakan.
<i>C. GRISICAPILLA</i> , Wald.	Mooleyit and Northern Tenasserim.
<i>C. BICOLOR</i> , Scop.	Mergui Archipelago. Andamans. Nicobars.

#### Family Columbidae.

This family comprises the Doves and Pigeons. It may be divided into *Palumbinae*, or wood pigeons; *Columbinae*, rock pigeons; *Macropygiinae*, or long-tailed doves; and *Turturinae*, or true doves.

#### PALUMBINÆ.

<i>ALSOCOMUS PUNICEUS</i> , Tickell.	Arakan. Toung-ngoo. Tenasserim.
--------------------------------------	---------------------------------

#### COLUMBINÆ.

<i>COLUMBA LIVIA</i> .	
var. <i>INTERMEDIA</i> , Strickland.	

Blyth describes it as widely distributed in Burma as in India, but Hume doubts its occurring there. It is included by Mason, but he gives no locality.

#### MACROPYGINÆ.

<i>MACROPYGIA TUSALIA</i> , Hodg.	Mooleyit and Karen-ni.
<i>M. RUFICEPS</i> , Tem.	Mergui ( <i>vide</i> Blyth).
<i>M. ASSIMILIS</i> , Hume.	Karen Hills at 3000.
<i>M. RUFIPENNIS</i> , Blyth.	Andamans. Nicobars.

#### TURTURINÆ.

<i>TURTUR LEXA</i> .	Arakan. Tenasserim.
Gyo-peing-tu-mā.	

<i>T. CAMBODIENSIS</i> , Gmel.	Pegu.
<i>T. SURATENSIS</i> , Gmel.	
<i>T. tigrina</i> , Tem.	Arakan. Pegu. Tenasserim. Nicobars.
<i>T. tigrinus</i> , according to Blyth, is hardly more than a race of <i>suratensis</i> .	
<i>T. HUMILIS</i> , Tem.	Toung-ngoo. Tenasserim. Andamans.
<i>T. humilior</i> , Hume.	
<i>T. RISORUS</i> , L.	Pegu (not common).
<i>T. TRANQUERARCTUS</i> , Hermann.	Arakan.
This species would seem to be replaced to the south by <i>humilis</i> .	
<i>T. STRIATA</i> , L.	Pakeham and Southern Tenasserim.

### Family Gouridæ.

The Burmese members of the family of ground doves may be divided into *Phapinæ* or ground doves, and *Calaninæ* or Nicobar ground pigeons.

#### PHAPINÆ.

*CHALCOPHAPS INDICA*, L. Arakan. Pegu. Tenasserim. Andamans. Nicobars.

#### CALENINÆ.

*CALEXAS NICOBARICUS*, L. Andamans. Cocos, and the Mergui Archipelago.

This bird breeds in thousands on Batty Malve, for a description of which, its only known breeding station, see S.F. ii. p. 94.

### Order GALLINÆ.

The order of gallinaceous birds embraces not only many showy and eminently beautiful birds, but the most useful to man of the whole class. Two families only are represented within our limits, the *Phasianidæ* and the *Megapodidæ*.

### Family Phasianidæ.

This family embraces the sub-families *Paroninæ* or Pea-fowl; *Arginæ* or Argus pheasants; *Phasianinæ* or Pheasants; and *Gallinæ* or Poultry.

#### PAVONINÆ.

*PAVO MUTICUS*, L. Chittagong. Arakan. Tenasserim. Oo-doung.

Blyth says this species is replaced in Silhet and Assam by *P. cristatus*, L., and that it is darker coloured and less vividly coloured in Burma than in Java.

Dr. Mason says that the Burmese consider that where there are peacocks, there are tigers, and this I believe is equally believed in India. Doubtless the country adapted for peacocks suits tigers as well. The peacock is also believed to be particularly affected by the presence of a tiger, perhaps from sometimes falling a victim to it, and in some parts of India the method of drawing them within shot, and inducing them to quit their cover, is by having a cardboard representation of a tiger, and coloured like that animal, drawn by a native on wheels through the jungle which peacocks are known to be sheltered in. The cry of the peacock is thought to herald rain, and also when heard at other times is supposed to indicate that a tiger is on foot in the neighbourhood. Lord Walden remarks: "The occurrence of this species in Burma offers a notable instance of the fact that Javan forms, unknown in the Malay peninsula south of Pinang, and in Sumatra and Borneo, reappear in Burma."

#### ARGINÆ.

*ARGUS GIGANTEUS*, Tem. Pakeham. Bankasun, and perhaps as far north as Mergui.

Davison gives an interesting account of these birds in S.F. vi. p. 427. They are solitary birds, even the sexes living usually apart. A remarkable trait in the male is the care he bestows in clearing a patch of ground some six or eight yards square of every leaf or stick, and which serves him as a space wherein to rest during the day, or as a sort of quarter-deck wherein to take exercise, and where the hen occasionally condescends to visit him. The males too are described as not being pugnacious, and as answering each other's calls in a friendly spirit. They are extremely wary birds, and it is next to impossible to approach them so as to get a shot without being discovered; but they are easily trapped, advantage being taken of the bird's care to remove all untidy objects from his hymeneal rink. The hen lays seven or eight eggs, spotted something like those of a turkey.

POLYPLECTRON CHINQUEIS, Tem. Silhet. Assam. Tenasserim. Mooleyit.

*P. tibetanus*, L.

*P. lineatum*, Hard. ♀.

Doung-kulā.

Confined in Tenasserim, according to Hume, to the easternmost hills, or perhaps their eastern slopes.

*P. BICALCARATUM*, L.

Mergui (?).

Hume suggests doubts if the skins formerly sent from Mergui, may not have been really brought from the Straits.

#### PHASIANINÆ.

EUPLOCAMUS LINEATUS, Lath.

Pegu. Martaban. Tenasserim.

Of the species of *Euplocamus* found in Arakan, Blyth remarks that it is *hybrid* between *E. lineatus* and *E. Horsfieldi*, Elliot, of Tippera and Sylhet; but as these are geographically separated from the home of *lineatus*, I suppose the word *hybrid* is used simply to signify an intermediate race, uniting the two dissimilar races to the North and South respectively.

*E. ANDERSONI*, Elliot.

Yunan.

This species would seem to be, according to Blyth, an intercalated race (hybrid so to speak) between *lineatus* and the well-known silver pheasant, *E. argentatus*, Swainson.

*E. CRAWFURDI*, Gray.

Northern Tenasserim.

*E. VIEILLIOTI*, Gray.

Malawōn. Bankasum. The Tenasserim Valley.

*E. ignitus*, Lath. (*vide* Hume).

THAUMALEA AMHERSTIÆ, Gould.

Yunan.

#### GALLINÆ.

GALLUS FERRUGINEUS, Gmel.

Arakan. Pegu. Tenasserim.

Jungle fowl. 'Tor-kyet.'

The Malayan Peninsula.

Very numerous throughout Burma, but does not ascend the higher ranges. Mr. Davison once counted near Palpooon a covey of thirty birds all seated on one enormous bent bamboo.

#### ROLLULINÆ.

ROLLULUS ROLLULI, Scop.

Tenasserim. Siam. Malayan

*R. cristatus*, Gmel.

Peninsula. Sumatra. Borneo.

The crowned partridge of Malacca, which extends to Mergui, is (says Jerdon) remarkable for wanting the claw of the hind toe. The crest is similar to that of the crowned pigeons (*Goura*), and its affinities are rather with the *Gallinæ* than the *Perdicinæ*.



Family **Tetraonidæ.**

This family embraces the *Tetraoninae*, Grouse (of which there are no representatives in India or Burma); *Perdiciinae* or Partridges; and *Coturnicinae* or Quails.

PERDICINE.

FRANCOLINUS CHINENSIS, Osb. Pegu.  
*F. Phayrei*, Blyth.

*F. Phayrei* is the Burmese race of *F. Chinensis*, differing only in being less robust.

ARBORICOLA RUFOGULARIS, Blyth. Mooleyit.  
 A. INTERMEDIA, Blyth. Arakan.  
 A. BRUNNEO-PECTUS, Tickell. Toung-ngoo and Karen Hills over 3000 feet.  
 A. CHLOROPUS, Tickell. Pegu. Tenasserim.  
 A. CHARLTONI, Blyth. Southern Tenasserim.

This is a Pinang species, and Hume doubts its occurrence in Tenasserim, but mentions its having been recorded there.

CALOPERDIX OCTLEA, Tem. Mergui. Prov. Wellesley.  
*C. ocellata*, Raffles.  
 BAMBUSICOLA FYTCHER, J. Anderson. Ponsee, at 3000 feet.

COTURNICINE.

COTURNIX COMMUNIS, Bonaparte. Arakan. Martaban. Karen-ni.  
 C. COROMANDELICUS. Upper Burma.  
 ECALEFACTORIA CHINENSIS, Bonaparte. Arakan. Tenasserim.

Family **Tinamidæ.**

TURNICINE.

TURNIX MACULOSA, Tem. Tippera. Pegu. Tenasserim.  
*T. Blanfordi*, Blyth.

*T. Blanfordi* is probably a sufficiently marked local race, but neither Hume nor Walden (doubtless with more copious materials than Blyth possessed) recognize it as a distinct species. It is the same thing over and over again. A typical specimen of a local *race* of some species comes to hand, and at once receives a specific name on the strength of the racial or geographical variation it presents. Fuller knowledge shows that the so-called *species* is indissolubly linked to some older species, though diverging in some particulars, and covering, so to say, its non-appropriate area. "Natura non facit saltum."

T. PLUMBIPES, Hodg. Nipal. Assam. Arakan. Pegu. Tenasserim.  
 The Malayan Peninsula.

Hume remarks, "There appear to be two distinguishable species of the *pugnax* type of Bustard quail occurring within the limits of the British Indian Empire. The one inhabiting the Malay Peninsula, Burma, Eastern Bengal and the Himalayas as far West as any rate as Nipal, and the other inhabiting the rest of India proper.

"The former is clearly *plumbipes* of Hodgson, the other *taigoor* of Sykes. The exact limits are as yet to a certain extent undefined. I have received both species from Cachar, and both from the dry upper portions of Burma and Thayet-myo." S.F. vi. p. 451.

T. PUGNAX, Tem. Pegu.

Hume unites *taigoor*, Sykes, with this species; but Jerdon keeps them apart. Doubtless they are representative races.

T. JOUDERA, Hodg. Andamans. Nicobars (Camorta).  
*T. albicentris*, Hume.

*Family Megapodiidæ.*

The Megapodes are a remarkable and aberrant family of the present order. They are dull-coloured birds of middle size, and the sexes do not greatly vary in appearance. Their feet are large, an adaptation to the peculiar method they adopt of burying their eggs beneath a mound of mixed sand and vegetable matters, wherein the eggs are hatched by the heat generated by the decaying vegetable substances. According to Mr. Hume, who gives an interesting account of their habits (S.F. ii. p. 276), a pair of birds commence a mound, which all the progeny which are hatched from it continue to use. The mounds, therefore, vary greatly in size with age, and are renewed from time to time, by the birds removing the outer portions, which have become effete as it were, and adding fresh vegetable matter with a fresh top covering of sand, consisting mainly of comminuted coral and shells. The mounds examined were situated just within the dense jungle commencing above high-water mark.

MEGAPODUS NICOBARIENSIS, Blyth.

Nicobars.

Hume found mounds of this species, as he presumes, on Table Island, off Great Cocos. The eggs are large, averaging  $3.25 \times 2.07$ , and when freshly laid are a deep pink. During the process of hatching, this colour deepens into brown, probably from the stains it takes up from the surrounding moist rubbish.

## Order GRALLÆ.

The Waders are characterized by long legs, naked above the knee, and by toes not webbed, and usually powerful wings. The Bustards are runners and the Rails swimmers, but the bulk of the order are waders and walkers. In some the trachea is singularly convoluted, being bent back into a loop (lodged between the two walls of the ridge of the sternum), before it enters the lungs.

*Family Otididæ.*

The Bustards, remarks Blyth, are "foreign to the Indo-Chinese countries, but a straggler of the Sikh Floriken *Syphaotides aurita* is recorded as having been shot at Sandoway in Arakan."

*Family Glareolidæ.*

The 'Pratincoles' are a peculiar group allied to the plovers, but in their wide gape and forked tails, and their crepuscular habits, and mode of hawking insects in the air, display affinities to the swallows and *Caprimulgidæ*.

GLAREOLA ORIENTALIS, Leach.

Arakan. Pegu. Toung-ngoo. Tenasserim.

Andamans. Nicobars.

G. LACTEA, Tem.

Arakan. Pegu. Tenasserim.

*Family Charadriidæ.*

Plovers, says Jerdon, are more or less gregarious birds, that feed on bare plains, ploughed lands, moors and wilds or wet meadow land, a few preferring the banks of rivers, sand banks, or the edges of tanks. The eggs are usually four in number (occasionally two), and are of a stone colour or some shade of green, and richly blotched with black or brown.

## ESACINÆ.

The stone-plovers are large birds with strong bills and no hind toe.

ESACUS RECURVIROSTRIS, Cuv.

Arakan. Pegu. Tenasserim.

Confined to the banks of rivers and rare in Tenasserim.

E. MAGNIROSTRIS, Geoffr.

Islands of the Mergui Archipelago.

Andamans. Cocos.

ŒDICNEMUS CREPITANS, Tem.

Pegu.

Œ. SCOLORAX, Gmel.

Plains of Central Tenasserim.

CHARADRIINÆ.

SQUATAROLA HELVETICA. Arakan. Amherst. Toung-ngoo. Andamans.  
A rare straggler.

CHARADRIUS FLUVIS, Gmel. Arakan. Pegu. Tenasserim.  
*C. longipes*, Tem. Andamans. Nicobars.  
*C. virginicus*, apud Blyth.  
*C. pluvialis*, apud Sykes.  
*C. orientalis*, Schl.

EUDROMIAS VEREDUS, Gould. Andamans.

A single specimen only was obtained by Dr. Dobson in 1872. A description is given in S.F. i. p. 84.

ÆGIALITIS GEOFFROYI, Wagl. Thatone Creek. Amherst. Andamans. Nicobars.

A rare winter visitant.

Æ. MONGOLICA, Pall. Arakan. Pegu. Tenasserim.

Æ. CURENICUS, Gmel. Pegu.

Æ. *Philippensis*, Scop.

Æ. ALEXANDRINA, L. Arakan. Toung-ngoo.

Æ. CANTIANA, Lath. Tenasserim.

A winter visitant.

Æ. FLUVIATILIS, Beck. Andamans.

Æ. MINUTA, Pall. Pegu. Tenasserim.

Æ. PLACIDA, Gray. Pegu (?).

Æ. DUBIA, Scop.

Smaller than the European *Æ. curenicus*, but otherwise similar, and of common occurrence.

Lord Warden remarks, "*Æ. philippensis*, apud Jerd., No. 849, and which is the number in Mr. Blyth's MS., is=*C. curenicus*, Gm. But perhaps the species actually intended by Mr. Blyth is *Æ. minuta* (Pallas), apud Jerdon, No. 850, and of which Lieutenant W. Ramsay obtained specimens at Tonghoo. The title *C. philippensis*, Lath., was founded on the same plate as that of *C. dubius*, Scopoli. Until the species which inhabits the island of Luzon has been studied, the correct titles for the two species cannot be determined. The synonymy is very simple, but the correct application of the various titles cannot be made until the Philippine type has been compared."

VANELLINÆ.

The Lapwings are a well-marked subfamily. Some are crested. A few have the wings 'spurred,' and some have wattles of skin at the base of the bill.

CHRETSIA CINEREA, Blyth. Pegu. Toung-ngoo. Tenasserim.

*C. inornata*, Schl.

LOBIVANELLES GOENSIS, Gmel. Arakan. Pegu. Tenasserim.

*L. atronuchalis*, Blyth.

The Burmese race has been separated as *atronuchalis*.

HOPLOTERUS VENTRALIS, Cuv. Pegu. Arakan. Tenasserim.

The wing is armed with a horny spur. There is no hind toe.

SARCIOPHORUS MALABARICUS, Bodd. Pegu.

*S. bilobus*, Gmel.

Family **Hæmatopodiidæ.**

The sea plovers embrace three subfamilies. Turnstones, oyster catchers, and crab-plovers. They all frequent the sea-shore, and feed on *crustacea* and shell-fish.

## STREPTILINÆ.

STREPTILAS INTERPRES, L.

Arakan. Preparaïs. Cocos. Andamans.  
Nicobars.

This species has been found by Jerdon in the Dekkan, 200 miles from the sea, frequenting a large tank.

## HEMATOPODINÆ.

HEMATOPUS OSTRALEGUS, L.

Arakan.

## DROMADINÆ.

DROMAS ARDEOLA, Paykull.

Arakan. Andamans.

This bird, strange to say (since its apparent affinities are with *Ædicnemus*), lays one large white egg at the end of a burrow from two to four feet in length (S.F. viii. p. 381), after the fashion of the Puffin. This remarkable fact was first discovered by Von Hueglin, and subsequently corroborated by Capt. E. A. Butler. The egg measures  $2.54 \times 1.77$  inches. The bird weighs only one pound, whilst *Æsacus magnirostris*, which weighs 2 lbs. 4oz., lays an egg of precisely the same size.

## Family Gruidæ.

The Cranes are more nearly allied to the Plovers than to Herons and Storks. They feed much on grain, lay two spotted eggs on the ground, and have a fine trumpet-like call. Many are migratory and highly gregarious.

GRUS ANTIGONE.

Arakan. Pegu and Martaban.

Kyo-gyā.

G. LONGIROSTRIS, Tem.

The common crane is recorded by Mason, and was observed by Mr. Swinhoe in Hainan (Blyth).

The last species is resident; the present a rare straggler.

## Family Scolopacidæ.

The snipes and sandpipers, says Jerdon, "form a continued series graduating into each other, with various modifications of the bill as to length, strength, hardness, and form." The bill is short in the Stints (*Tringina*), curved in the Curlews (*Numeniina*), upturned in the Godwits (*Limosina*), soft in the Snipes (*Scolopacina*), and moderately hard in the Sandpipers (*Totantina*). They all lay four greenish or brownish eggs, brown or black spotted. The most typical of the family are the Snipes.

## SCOLOPACINÆ.

GALLINAGO NEMORICOLA, Hodg.

Southern Tenasserim.

A single specimen was flushed by Davison near Malewōn.

G. STREXURA, Kuhl.

Arakan. Pegu. Tenasserim. Andamans.  
Nicobars.G. *Horsfieldii*, Gray.

The most common snipe of the Indo-Chinese and Malayan countries (Blyth). Hume says the majority migrate, but a few remain the whole year.

G. GALLINULA, L.

Pegu, where rare.

G. SCOLOPACINA, Bonap.

Upper Burma. Pegu. Toung-ngoo.  
Andamans.

SCOLOPAX RUSTICOLA, L.

Pegu. Tenasserim, where rare.

RHYNCOLEA BENGALENSIS, L.

Arakan. Pegu. Tenasserim.

The painted snipe has been obtained near Rangoon, but it is rare.

## NUMENINÆ.

The Curlews have long curved bills and are wary birds. They are good eating, especially the 'whimbrel.'

NUMENIUS ARGUTA, L.

Arakan. Pegu.

The 'curlew.'

N. LINEATUS, CHV.

Common along the coast. Andamans.

N. PHÆOPUS, L.

Arakan. Pegu. Tenasserim. Andamans. Nicobars.

The 'whimbrel.'

*N. tenuirostris* is stated by Jerdon also to occur in Burma.

## LIMOSINÆ.

LIMOSA LEGOCEPHALA, L.

Arakan. Maulmain.

A rare straggler.

TEREKIA CINEREA, GÜLD.

Arakan. Pegu. Tenasserim. Andamans.

The Avocet sandpiper, so called from its recurved bill.

## TRINGINÆ.

TRINGA DAMACENSIS, HORSF.

Arakan. Pegu. Tenasserim.

T. MINUTA, LEISLER.

Arakan. Pegu. Tenasserim.

*T. damacensis*, apud Blyth.

Andamans. Nicobars.

These two species would seem to have been confounded together. Hume says, "The two main points of distinction are these. In *minuta* the shafts of the primaries are mostly white, in *damacensis*, as in *temminckii*, with the exception of that of the first primary, the rest of the shafts are brown. The second distinction consists in the much greater length of the middle toe." This remark holds good even with the larger race of *minuta* var. *altescens*, though on the whole *damacensis* Mr. Hume regards as somewhat the smaller bird (S.F. i. p. 884).

T. TEMMINCKII, LEISLER.

Arakan. Pegu. Tenasserim.

T. RUFICOLLIS, PALLAS.

Tenasserim.

*T. subminuta*, MIDD.

T. SUBARQUATA, GÜLD.

Arakan. Tenasserim. Andamans. Nicobars.

T. PLATYRHYNCHIA, TEM.

Arakan. Andamans (rare).

EURYNORHYNCHUS PYGMEUS, L.

Arakan and Tenasserim, in

*E. griseus*, apud Jerdon.

estuaries and mud banks left by the tide.

MACHETES PUGNAX, L.

Arakan. Pegu.

## TOTANINÆ.

ACTITIS GLAREOLA, L.

Arakan. Pegu. Tenasserim. Andamans.

A. OCHROPUS, L.

Arakan. Pegu. Tenasserim.

A. HYPOLEUCUS, L.

Arakan. Pegu. Tenasserim.

Andamans. Nicobars.

A few of these must remain in the country, as Oates has shot one on August 14th.

TOTANUS GLOTTIS, L.

Arakan. Pegu. Tenasserim.

This 'greenshank' is excellent eating. It arrives in September and leaves in April.

T. STAGNATILIS, BECHS.

Arakan. Pegu. Tenasserim.

T. HAUGHTONI, ARMSTRONG.

Amherst.

T. CANESCENS, GMEL.

Pegu (*vide* Oates). Nicobars.

A rare straggler.

The next two species have red legs.

T. CALIDRIS, L.

Arakan. Pegu. Tenasserim. Andamans.

T. FUSCUS, L.

Arakan. Pegu. Tenasserim.

*Family Himantopodidæ.*

The 'Stilt-shanks' differ from the Snipes in their slender bills, very long legs, and mode of colouring. They fly with a peculiar tern-like call, and are said to swim well. The hind toe wanting.

HIMANTOPUS CANDIDUS, Bonaterre. Arakan. Pegu. Tenasserim.  
*H. intermedius*, Blyth.

It is rather doubtful if there is really more than one species throughout Europe and Asia.

*Family Parridæ.*

Feet enormous, claws long. Females larger than the males, a fact which militates against their association with the plovers.

PARKA INDICA, Lath. Arakan. Pegu. Tenasserim.

Oates describes this bird as stupidly tame, and making itself a nuisance by getting in the way of the duck shooter. It lays several olive-brown eggs, very handsomely lined with black.

HYDROPHASIANUS CHIRURGUS, Scop. Arakan, and rarely in Pegu and Tenasserim.

The eggs of this handsome bird are pyriform and of a spotless bronze-brown or green.

*Family Rallidæ.*

Bill uncuneiform. Legs stout, feet large. Tail short or wanting.

## GALLINULINÆ.

The 'water-hens' have the base of the bill prolonged into a thick horny casque covering the forehead. Many of them are extremely finely coloured. They all lay spotted eggs.

PORPHYRIO POLIOCEPHALUS, Lath. Arakan. Pegu. Tenasserim.  
 PODICA PERSONATA, Gray. Cachar. Pegu. Tenasserim.

"These very rare birds in Tenasserim," remarks Col. Tickell, "are met with in shady deep narrow streams in forests, whether in the tideway or remotely inland. They swim rapidly, but seldom dive; and although eminently aquatic in conformation, resort, strange to say, for safety to land. Scrambling up the steep banks when shot at, and running with unexpected rapidity into dense thickets, its flight is like that of the Coot, or Water-hen, squatting along the surface of the water."

GALLICREX CINEREUS, Gmel. Arakan. Tenasserim. Andamans.  
*G. cristatus*, Lath.  
 FULICA ATRA, L. Arakan.  
 GALLINULA CHLOROPUS, L. Arakan. Pegu.  
 G. PILENICTRA, Pennant. Arakan. Pegu. Tenasserim. Andamans. Nicobars.

## RALLINÆ.

The Rails are smaller than the Gallinules and less social, and keep much to swamps and dense herbage, through which their narrow compressed body enables them to thread their way. They swim well, but fly badly.

PORZANA MARUETTA, Brisson. Arakan.  
 P. PYGMEÆ, Naumann. Arakan. Andamans.  
 P. FUSCA, L. Pegu.

Hume says this must be rare in Tenasserim.

- P. BAILLONI, Vieill. Tavoy.  
P. CEYLONICA, Gmel. Pegu.  
*P. amauroptera*, Blyth ♀.  
ERYZONA CUNNINGI, Tytler. 'Bamboo flat,' Mt. Harriet, Andamans.  
Very rare, or so shy, that only some four specimens have been shot.  
RALLUS STRIATUS, L. Arakan. Pegu. Tenasserim.  
R. INDICUS, Blyth. Arakan.  
RALLINA FASCIATA, Rafll. Pegu. Tenasserim (where rare).  
HYPOLEXIDIA STRIATA, L. Pegu. Tenasserim. Andamans.  
The Andaman race is darker coloured and larger than the Indian.

*Family Ciconiidae.*

The Storks have the bill large and stout. They are large birds, more bulky than the Herons, and have a web between the inner and middle toes. Some species are migratory and gregarious, and they all lay two to four white eggs without spots.

- LEPTOPTILUS ARGALA, L. Arakan. Pegu. Tenasserim.

The adjutant quits Bengal in the cold weather for Burma, where it breeds; the scarped and almost inaccessible limestone rocks near Maulmain being one of its favourite haunts. The gular pouch, which is so prominent a feature in this bird, is a mere vascular sac, and has no connexion with the oesophagus. At the same time it will swallow very large morsels, and what more natural than for the non-scientific observer to *suppose* these go into its pouch. I have myself a strong impression that I once saw one swallow a small dead cat, and I think Col. Tickell told me that one he once shot disgorged in his presence the head of a child, which, like the cat, may have been a small one!

- L. JAVANICA, Horsfield. Arakan. Pegu. Tenasserim.  
MYCTERIA ASIATICA, Lath. Arakan. Pegu. Tenasserim.

Hume says the black-necked stork is confined in Tenasserim to the extreme north.  
CICONIA EPISCOPUS, Bodd. Arakan. Pegu. Tenasserim.  
A winter visitant.  
C. ALBA, Belon (recorded by Mason from Burma).

*Family Ardeidae.*

Bill sharp and deeply cleft. Outer toe only joined by a web to the middle one. The middle toe with the inner edge of the nail dilated and pectinated. Their food is wholly animal and mainly fish. The herons are mostly solitary birds when feeding, but roost in company, and multitudes assemble and construct their nests in company on the same tree or trees, forming what are called heronries. They all lay five or six pale green eggs.

- ARDEA CINERA, L. Arakan. Pegu. Tenasserim.  
A. SUMATRANA, Raffles. Arakan. Tenasserim.  
*A. typhon*, Tem.  
A. PURPUREA. Arakan. Pegu. Tenasserim. Andamans. Nicobars.  
HERODIAS ALBA, L. Arakan.

Great confusion has arisen from writers (Bonaparte, Schlegel, etc.) ignoring the fact that the colour of the bill is seasonal, the adult in the breeding season having it black, and at other times yellow.

- H. INTERMEDIA, Wagler. Pegu. Blamo. Andamans.  
H. GAZETTA, L. Pegu. Andamans. Nicobars.  
H. EULOPHOTES, Swinhoe. Pegu. Tenasserim.  
H. CONCOLOR, Blyth. Arakan. Andamans. Nicobars.  
H. MELANOPUS, Wagler. Thayet-myo.

Capt. Fielden thus identified a heron which bred abundantly in Thayet-myo. Hume says it is certainly not *garzetta*, and is perhaps neither *melanopus* nor *coromandus* (S.F. iii. p. 190).

DEMIGRETTA SACRA, Gmel.	Tenasserim Coast. Andamans. Nicobars.
BUPHUS COROMANDUS, Bodd.	Arakan. Andamans.

The 'cattle heron,' is so called from being frequently seen in attendance on cattle, following them to pick up grass-hoppers or insects disturbed by them in grazing.

ARDEOLA GRAYI, Sykes.	Arakan. Pegu. Tenasserim. Andamans.
<i>A. leucoptera</i> , Bodd.	

The common paddy bird, the tamest and most familiar bird of its family.

A. PRASINOCOLLIS, Swinhoe.	Southern Tenasserim.
BUTORIDES JAVANICA, Horsf.	Arakan. Pegu. Tenasserim. Andamans. Nicobars.

ARDETTA FLAVICOLLIS, Lath.	Arakan. Pegu. Tenasserim.
A. CINNAMOMEA, Gmel.	Arakan. Pegu. Tenasserim. Nicobars.
A. SINENSIS, Gmel.	Arakan. Pegu. Tenasserim. Andamans. Nicobars.

GORSUCHIUS MELANOLOPHUS, Raffles.	Ramri. Malawön. Nicobars.
NYCTICORAX GRISEUS, L.	Arakan. Pegu. Tenasserim. Nicobars.

### Family Tantalidæ.

This family is divided into *Tantalinae* or Wood Ibises; *Platalvine* or Spoonbills; *Anastomatinae* or Shell-eaters; and *Ibisinae* or Ibises.

#### TANTALINÆ.

The Wood Ibises are largish birds, with shorter legs than the herons and longer and more obtuse bills. They build in trees, often in communities, and lay white eggs usually spotted or blotched with red or brown.

TANTALUS LEUCOCEPHALUS, Gmel.	Pegu. Tenasserim.
-------------------------------	-------------------

#### ANASTOMINÆ.

Bill thick and solid, gaping in the middle. This space between the upper and lower jaws exists in the young, and is not the result of attrition by the shells the bird devours, as might be supposed. It must be viewed as the survival of an ancestral character, doubtless of use to some remote progenitor, but which has ceased to be so amidst modern surroundings.

ANASTOMUS OSCITANS, Lath.	Pegu. Tenasserim.
Khe-u-tsoh.	

#### IBISINÆ.

IBIS MELANOCEPHALUS, L.	Arakan. Tenasserim.
Kalā gonk. The white Ibis.	
GERONTICUS PAPILLOUS, Tem.	Arakan.
GRAPTOCEPHALUS DAVISONI, Hume.	Southern Tenasserim.
FALCINELLUS IGNEUS, Gmel.	Arakan. Pegu (world wide).

This Ibis was sacred in Egypt, and on its death was embalmed.

*Platalia leucorodia*, L., is included in the list of birds in the earlier edition of Dr. Mason's work, but neither Blyth, Hume, nor other collectors have met with it.

### Order ANSERES.

This order embraces all the *Anatidæ* or Lamellirostres, together with the Loons, Grebes, Gulls, Petrels, Cormorants and Pelicans, together with the Auks and Penguins of high latitudes. The order is subdivided into those birds whose young feed themselves (*Autotrophous*), and those whose young require to be fed by their parents (*Heterotrophous*).



*a. Young autotrophicous.*

*Family Anseridæ.*

The birds of this family all lay unspotted eggs of some shade of green or pale brown.

PLECTROPTERINÆ.

The spurred geese are so called from being usually provided with one or more spurs on the shoulder, and a bill with a boss or protuberance at its base. The legs are usually long, but the Muscovy duck is an aberrant form with unusually short legs.

SARKIDORNIS MELANOTIS, Pennant.      Arakan. Pegu.  
Tor-wôn-hai.

NETTAPODINÆ.

NETTAPUS COROMANDELIANUS, Gmel.      Arakan. Pegu. Tenasserim.

The 'cotton teal' is remarkable for its habit of breeding in trees, often at some distance from water, and there seems no doubt that the newly-hatched young are conveyed by the parent birds in their mouth to the nearest water. Tickell mentions this bird as making its nest on a palm tree. The 'golden eye' (*Fuligula cristata*) is another teal which also breeds in trees, strange as such a habit seems in such a bird.

TADORNINÆ.

The shieldrakes and whistling teal are, according to Jerdon, intermediate between the geese and ducks. They have the wing spot of the latter, but the voice and the plumage alike in both sexes, as the former.

DENDROCYGNA AUSTREE, Sykes.      Arakan. Pegu. Tenasserim. Nicobars.

This species breeds on the ground, but occasionally in trees like the last, according to Jerdon.

D. FULVA, Gmel.      Pegu.  
*D. major*, Jerdon.

CASARCA RUTILA, Pallas.      Arakan. Pegu. Tenasserim.

The ruddy shieldrake or Braminy duck.  
This is a winter visitant, which breeds in Thibet.

C. LEUCOPTERA, Blyth.      Rare in Tenasserim, according to Hume.

Inhabits the valleys of the great rivers, from the Megna, at least to the Tenasserim. The *Anas scutulata*, S. Müller, seems to be a domesticated, if not hybrid, variety of this species, and the examples of it in the British and Leyden Museums have much intermixture of white in the plumage.

*Family Anatidæ.*

The Ducks differ from the Geese by having a broader and more depressed bill, and with the laminae more developed. The sexes too differ greatly in colour, the male being conspicuously handsomer. There are two subfamilies, the Ducks and the Pochards.

ANATINÆ.

ANAS PECTILORHYNCHA, Pennant.      Arakan. Blamo. Tenasserim.

Hume did not procure this bird, and on that ground doubts its occurrence. As Blyth records it from Tenasserim, he was probably more fortunate. A positive record of a man like Blyth is not to be set aside simply because another man has not personally been able to verify it.

A. CARYOPHYLLACEA, Lath.      Arakan. Blamo.  
A. SIREPORA, L.      Arakan.

The Gadwall is one of the best ducks for the table.

*DAFILA ACUTA*, L.

Arakan.

The Pintail is also excellent eating.

*QUERQUEDULA CRECCA* L.

Arakan. Bhamo.

*Q. CRECA*, L.

Arakan. Pegu. Toung-ngoo. Tenasserim.

The blue-winged Teal has been known to breed near Maulmain (Blyth).

*MARECA PENELOPE*, L.

Arakan.

*M. GIBBERIFRONS*, S. Müll.

Andamans.

*Quer. Andamanensis*, Tytler.

*M. albigularis*, Hume (*vide* Wadden).

#### FULIGULINÆ.

The Pochards are of a stout heavy form, with close thick plumage, and are excellent divers. Their flesh is indifferent and fishy.

*ATHYA RUFINA*, Pallas.

Bhamo.

The red-crested Pochard.

*A. NYROCA*, Gûld.

Arakan.

The white-eyed Duck.

#### Family **Podicipidæ**.

All the Grebes lay rather pointed oval eggs of spotless white, which soon however, become stained brown by the materials of the nest. They swim and dive well, using their wings under water as well as their feet. Their plumage is dense, soft, and the underparts silky.

*PODICEPS MINOR*, L.

Arakan. Pegu. Tenasserim.

#### Family **Procellariidæ**.

Of the Petrels of the Burmese coast, less is known than of almost any other birds. One species only seems to have been obtained by Hume, *Oceanites oceanica*, Banks, which was pretty numerous off the Moscows, a group of islands near the coast.

#### Family **Laridæ**.

This family is divided into three subfamilies. *Lestridinæ* or Skua Gulls, *Larinæ* or Gulls and *Sterninæ* or Terns.

#### LESTRIDINÆ.

*STERCORARIUS POMARINUS*, Tem.

Maulmain.

Tickell procured an adult skua, which was referred to the above species, and Jerdon comments on the singularity of a bird of high latitudes being found there. Hume, however, suggests (S.F. i. p. 268) if Tickell's bird did not *really* belong to a species which is common on the coast of Sind and in the Gulf of Oman, and which he refers, with doubt, to *S. parasiticus*, L., or more probably he thinks to a new species, which he terms *S. asiaticus*. It remains of course to decide if *S. asiaticus*, Hume, really occurs in Burma.

#### LARINÆ.

The Gulls are a well-marked group of birds, which walk pretty well, but swim and fly with remarkable ease and buoyancy. They breed on the ground or on rocks, and lay from two to four greenish eggs, richly blotched with dark brown.

*NEMA BRUNNEICEPHALA*, Jerdon.

Arakan Coast.

*N. RIDIBUNDA*, L.

Arakan Coast.

*LARUS ICHTHYAËTUS*, Pallas.

Ramri (Blyth).

STERNINÆ.

Terns may be said to be gulls, of a more delicate make, with straighter and more slender bills, and with longer wings and shorter legs. They seek their food mainly on the wing, sometimes plunging into the water for it. Their flight is moderately rapid, but wavering and unsteady, and they breed in countless numbers on sand or mud banks, laying three or four spotted eggs of similar colouration as the gulls.

GELOCHELIDON ANGLICA, Montagu.	Arakan and Tenasserim.
HYDROCHELIDON INDICA, Stephens.	Arakan and Tenasserim.
<i>Gelochelidon innotata</i> , Beavan (juv.).	
H. HYBRIDA, Pallas.	Martaban.
<i>H. javanica</i> , Horst. ( <i>vide</i> Hume).	
STERNA AURANTIA, Gray.	Arakan and Tenasserim.
STERNA MELANOGASTER, Tem.	Arakan. Tenasserim.
<i>S. Jerdoni</i> , Beavan (juv.).	
S. DOUGALLI, Mont.	
S. PARADISEA, Brünnh.	Andamans.
S. MINUTA, L.	Young-ngoo.
S. BERGII, Licht.	South of Mergui.
S. BENGALENSIS, Less.	Kamorta.
S. MEDIA, Horst.	Arakan. Tenasserim.
S. SUMATRANA, Radll.	Moscows and Mergui Archipelago.
ONYCHOPRION MELANASTICHEN, Tem.	Nicobars. Andamans.
O. ANOSTHELIUS, Scop.	Andamans.
ANOUS SIOLIDUS, L.	Mergui Archipelago. Andamans.
The Noddy.	
A. SENEX, Leach.	Andamans.
RUYNCHOPS ALBICOLLIS, Swainson.	Pegu. Tenasserim.

This remarkable bird, the 'Skimmer,' has the upper bill much shorter than the lower. The bill is fine and compressed at the point and flexible. It associates in flocks, and flies close to the water, skimming over its surface, and occasionally dipping in its bill. What it feeds on is unknown, as Jerdon never found anything in the stomach but a little oily fluid.

Family **Phaëtonidæ.**

PHAËTON INDICUS, Hume.	Arakan Coast.
P. RUBRICAUDA, Bodd.	Nicobars.
P. LETHEREUS, L.	Andamans. Cocos. Nicobars.
P. FLAVIROSTRIS, Brandt.	Andamans.

The Boatswain birds are oceanic in their habits, but perch and build on trees. Jerdon regards them as related to Gannets and Terns.

Family **Sulidæ.**

SULA AUSTRALIS, Steph.	Ranges north to the Mergui Archipelago.
The southern Booby.	
SULA FIBER, L. (?)	Preparis and Cocos.
A pair of birds was seen, which Hume refers to this species.	

Family **Pelecanidæ.**

Bill enormous, with a large mandibular pouch.	
PELECANUS JAVANICUS, Horst.	Pegu. Tenasserim.
P. PHILIPPENSIS, Gmel.	Pegu. Tenasserim.

*Family Graculidæ.*

## GRACULINÆ.

The cormorants swim and dive with facility, but on rising from the water, flap it with their wings before getting well under weigh. In pursuit of fish they commonly enter the baskets set by fishermen and are of course drowned. They are social birds and breed in communities, laying three or four greenish white eggs of an elongated oval form.

GRACULUS CARBO, L.

Upper Burma, Tenasserim.

G. FUSCICOLLIS, Brandt.

Bhamo. Martaban.

G. PYGMEUS, Pallas.

Arakan. Pegu. Tenasserim.

## PLOTINÆ.

The Darters or snake-birds have a very elongated neck, and swim so low, that often the head and neck only are seen above the water like a snake. Jerdon likens them to cormorants with the head and neck of a heron, a very apt simile.

PLOTES MELANOGASTER, Gmel.

Arakan. Pegu. Tenasserim.

*P. novahollandia*, Gould.

## Order RAPTORES.

*Family Vulturidæ.*

These useful birds, observes Mr. Oates, "are nowhere very numerous in Burma, except on the occasion of any dead animal being exposed to view. As the Burmese are in the habit of eating animals which die of disease, not much food is available for vultures, and it is only in the immediate neighbourhood of large villages that flocks of these birds are found." There is, however, another fact which in my opinion has quite as much to do with the scarcity of vultures in so many parts of Burma as the necrophagous habits of the inhabitants. A large portion of Burma is well wooded, and vultures, which find their food by sight rather than smell, do not in consequence occupy such tracts. All ornithologists will remember the controversy of old, regarding the greater use of sight or scent by vultures, and how Waterton, from his personal experience, upheld the cause of eyes *versus* nose. I myself have in India verified his observations by noticing on more than one occasion the body of a dog shot under an umbrageous tree remaining unperceived by vultures, simply from its being hidden from their vision, though abundantly obvious to the human nose! Jerdon, too, takes the same view. The matter lies in a nutshell, and vultures simply cannot make a living in a wooded country where the carcase of an animal is screened from their circling gaze by thick vegetation. They all, therefore, affect open country and the neighbourhood of towns.

OTOGYPS CALVUS, Scop.

Pegu. Martaban and Tenasserim.

GYPS INDICUS, Scop.

Pegu. Tenasserim.

G. BENGALENSIS, Gmel.

Pegu. Tenasserim.

The Pali name of the Vulture is *gieza*, probably of common origin with the English word *gier*. The Burmese call all the Vultures *lenta* (Mason).

Vultures build bulky nests of sticks in large trees and lay a single white egg.

*Family Falconidæ.*

The Burmese generic name for the Falcon tribe is *theing*, from the verb *theing* "to strike with a motion towards one's self, to gather in." Hence the name signifies very much like "Birds of prey" (Mason).

## FALCONINÆ.

FALCO PEREGRINUS, Gmel.

Promo. Amherst. Thatōn (rare).

*F. communis*, Briss.

Preparis Island.

*F. calidus*, Latham (the Indian race).

The Peregrine Falcon, or '*Bhyri*' of Indian falconers, is a bold bird, which in its wild state will kill snipe, teal and duck, but which when trained will fly at large birds like herons and cranes. It is not supposed by Jerdon to breed in the country, but adults are caught, mostly along the coast. It is so daring that it will often seize and carry off ducks or other birds which have been just wounded by the sportsman. In striking its prey the claws are alone employed, not the beak, as artists often depict. The Peregrine leaves India in April and returns in October.

*F. PELEGRINATOR*, Gmel.

Toung-ngoo (rare).

This bird is the '*Shahin*' or 'Royal' of Indian falconers. It breeds in March and April and the young are taken in May. This and other falcons are also captured in the following manner: A thin strip of cane, about the length of the expanse of wing of the bird it is proposed to capture, is smeared with birdlime at either end, and in the centre a live pigeon or dove is fastened. The eyes of the bird are sewn up, to cause it to soar, and on a falcon being found, the pigeon is cast up. Should the falcon swoop at it, the lined strip of cane hampers its wings and it is easily captured. The '*Shahin*,' according to Jerdon, is not slipped from the hand at the quarry, but made to circle in the air above the falconer and his party. If a partridge or floriken is flushed at some distance, the '*Shahin*' makes two or three onward plunges in the direction and then darts down obliquely on the quarry, with half-closed wings and more than an arrow's velocity.

*HYPOTRIORHIS SEVERUS*, Horsf.

Tenasserim.

*TINNUNCULUS ALAUDARIUS*, L.

Pegu (common).

Jio-theing. 'Dove-hawk.'

Common in Karen-ni, rare in Tenasserim.

*T. saturatus*, Blyth, is the dark Tenasserim race, remarkable for the great development of the black markings.

*T. AMURENSIS*, Radde.

*ERYTHROPUS VESPERTINUS*, L. (?)

Thayet-myo.

A young bird seemed to belong to this species. Food *Blattæ*.

*POLIOHIERAX INSIGNIS*, Walden.

Upper Pegu.

*Lithofalco Fieldeni*, Hume.

Hume's name would seem to claim precedence by right, Lord Walden's by courtesy.

"The habits of these birds somewhat resemble those of Magpies. They perch exactly like a falcon; but if they wish to move along a branch, they hop sideways, or, if the branch is pretty upright, walk up it foot over foot, if I may use the expression, in the same manner as a magpie. When at all alarmed, they jerk their tail, and when much excited by the approach of any one, lower their heads exactly in the same way as some of the Owlets. Altogether, when moving about the branches of a tree, they might, at a short distance, be mistaken for a magpie, except for the shape of the head. The flight is also peculiar, a few tolerably rapid strokes, ending, if I remember rightly, in a slightly upward jerk, then a short sail through the air, and then a few more strokes, and so on" (Fielding, S.F. iii. p. 21).

*HIERAX CERULESCENS*, L.

Arakan. Pegu. Tenasserim.

*H. eulmos*, Hodg.

Doung-u-hnouk.

Named by the Burmese '*Peacock-brains*,' from the persuasion that it feeds on the brains of the peacock.

*H. FRINGILLARIUS*, Drapiez.

*M. cerulescens*, Vieillot.

Tenasserim. Borneo.

*H. MELANOLEUCUS*, Blyth.

Kachar, probably ranging into Arakan.

The pigmy falcons are the Liliputians of their family. Godwin-Austen remarks, "Their habits are shrike-like; they sit on isolated dead trees in the forest clearings, and sally off from time to time to seize some insect."

The eggs of *Hierax* are laid early in April, are four in number, oval, dead white

and without gloss, size  $1.2 \times 0.86$ . They are laid in holes of trees on a pad mainly composed of the wings of Neuroptera and Lepidoptera, mixed with rotten wood.

## ACCIPITRINÆ.

*ASTUR RUFINICTUS*, MacClell. Pahpun. Bankasun (rare).

*A. BADIUS*, Gmel.

Recorded from Tenasserim, but the next species probably meant.

*A. POLIOPHIS*, Hume.

Tenasserim (common).

Thcin-kyet-mā. The hen hawk.

*A. SOLOENSIS*, Horsf.

Malewōn (rare). The Nicobars.

*A. TRIVIRGATUS*, Tem.

Arakan. Tenasserim.

*ACCIPITER NISUS*, L.

Thayet-myo. Mooleyit (very rare).

*A. VIRGATUS*, Reinw.

Thayet-myo. Tenasserim (rare). Andamans.

The 'Besra' of Indian falconers. This species, says Jerdon, and other short-winged hawks and some falcons, are often taken by a net called 'Do gaz.' This net is 5 feet high and 3 feet broad, stained of a dark colour and fixed to two pieces of bamboo stuck lightly into the ground. In front of it a bird is fixed at the distance of a foot, and the hawk swooping at the bird is carried by the impetus into the net, which collapses and secures it.

## AQUILINÆ.

*AQUILA MÖGILNIK*, Gmel.

Pegu. Martaban. Tavoy (rare).

*A. CLANGA*, Pall.

Pegu. Tenasserim (*vide* Tickell, rare).

*A. BIFASCIATA*, Hard. and Gray.

Arakan.

Wōn-lō.

*A. HASTATUS*, Less.

Arakan.

*A. PENNATA*, Gmel.

Pegu. Maulmain. Thayet-myo.

*A. NEVIA* (?).

*A. orientalis* (Gurney).

Arakan.

The generic name for the Eagle in Burmese is *wōn-lō*, from *wōn*, a bear, and *lō*, like; the Eagle being like a bear among birds. Occasionally an eagle is called *shwe-len-lā*, "The golden Vulture" (Mason).

*S. MINIMUS*, Hume.

Andamans.

Resembles *cheela*, but is paler. The throat and chest entirely unbarred. Wings from 11.0 to 11.75 inches. It is the smallest of the genus.

*S. RUTHERFORDI*, Swinhoe.

Rangoon and Amherst.

*PANDION HALIAËTUS*, L.

Arakan. Tenasserim.

Wōn-let.

*POLIAËTUS ICHTHYAËTUS*, Horsf.

Pegu. Tenasserim.

*P. HUMILIS*, S. Müll.

Tenasserim.

*Ich. nanus*, Blyth.

*HALIAËTUS LEUCORYPHUS*, Pall.

Martaban.

*H. LEUCOGASTER*, Gmel.

Pegu. Tenasserim. Andamans.

Hume thus writes of this species: "The white-bellied sea eagle is very voracious, and during the morning I watched them incessantly returning to one or other of the big trees bearing sea snakes, 5 or 6 feet in length, in their claws, which they devoured at their ease. It is a fine sight to see these eagles striking one after another in rapid succession. Soaring far far above the highest tree in the island, often, I should judge, to a height of at least 1000 feet, they come down with nearly closed wings, and with a rushing roar like that of a cannon ball, in a perfectly direct line, making an angle of about  $60^\circ$  with the water, which they scarcely seem to reach, before they are again mounting with heavy flaps, and with a yard or two of snake hanging dead in their talons" (S.F. iv. p. 423).

NEOPTIS MALAIENSIS, Reinw. Tenasserim.  
 LIMNALITES CALIGATUS, Raffles. Pegu.

Fielden describes this bird as very wild and wary. It is fond of washing, instinctively it would seem; for a young nestling, to whom a sardine tin of water was given, went through the pretence of washing in it, though hardly fledged and of course unable to get into so small a vessel (S.F. iii. p. 27).

SPIZAITUS LIMNAÏTES, Horsf. Pegu. Tenasserim.  
 S. ANDAMANENSIS, Tytler. Andamans.  
 S. ALBONIGER, Blyth. Mergui. Malacca. Borneo.  
 LOPHOTRIORCHUS KIENERII, Gerv. Tenasserim (?).  
 SPILOXIS CHEELA, Lath. Pegu. Toung-ngoo (*vide* Ramsay).  
 Doung-tswōn (generic).

S. RUTHERFORDI, Swinhoe. Pegu. Tenasserim.  
 S. BACHA, Daud.  
*E. bido*, Horsfield.  
 S. SPILOGASTER, Blyth. Ceylon (Burma?).  
 S. ELGINI, Tytler. The Andamans.  
 S. DAVISONI, Hume. Andamans.

Near *S. pallidus*, Wald., but has a very long crest, measuring from the forehead 5·2 inches backwards. Wings from 14 to 15·5 inches.

S. MINIMUS, Hume. Andamans.

BUTEONINÆ.

BUTEO PLUMIPES, Hodg. Thatōn.  
 B. PYRRHOGENYS, Sch. Tenasserim.  
*B. pygmaus*, Blyth (*monente auctore*).  
 B. JAPONICUS, Schl. Thayet-myo.  
 BUTASTUR TEESA, Frank. Pegu. Martaban.  
 B. INDICTUS, Gmel. Tenasserim.  
 B. LIVENTER, Tem. Pegu. Toung-ngoo. Amherst (rare in Tenasserim).  
 CIRCUS PYGÆGUS, L. Doubtfully recorded from Karen-ni and Tenasserim.  
 C. MELANOLEUCUS, Forst. Martaban. Pegu (rare in Tenasserim).  
 Thaïng-kyā or Theng-kyā.  
 C. ERUGINOSUS, L. Pegu. Martaban. Tenasserim. Andamans.  
 C. SWAINSONI, A. Smith. Arakan. Pegu (*vide* Blyth).

MILVINÆ.

HALIASTUR INDUS, Bodd. Pegu. Tenasserim, ranging as far south as Pinang.  
 Swōn-goung-hpyu.  
 MILVUS AFFINIS, Gould. Pegu and Tenasserim.  
 Tswōn-bōk (generic).  
 M. GOVINDA, Sykes. Pegu and Tenasserim. Andamans.  
 PERNIS PTILORHYNCHUS, Tem. Martaban (rare).  
*P. brachypterus*, Blyth (*monente auctore*).

The Indian 'Honey buzzard,' like its European congener, feeds by preference on honey-comb, or the larvæ of bees and wasps, and in default of them will eat other insects or reptiles, eggs and young birds. Jerdon was an eye-witness to this bird's attacking a comb, which it did without any particular ceremony or precaution, though it is difficult to understand how it escapes being severely stung on such occasions.

MACLERAMPHTUS ALPINUS, Western. Malewōn (very rare).  
 BAZA LOPHOTES, Cuv. Arakan. Tenasserim (rare).  
 B. SUMATRENSIS, Leclerc. South Tenasserim (very rare).  
*B. Jerdoni*, Blyth (?).  
 ELANUS MELANOPTERUS, Daud. Arakan. Pegu. Tenasserim.  
*E. caeruleus*, Desf.

The eggs of this bird are rather blunt ovals, and normally very richly coloured, resembling miniature *Neophron* eggs, or those of the more highly coloured eggs of true Falcons. They are sometimes, however, less profusely spotted or perhaps even white.

### Family Strigidæ.

The nocturnal 'Raptores' form a very natural family, every member of which is easily cognizable at a glance, from the specialized adaptation of its organization to its mode of life, or as Jerdon clearly puts it, "The large head and eye, the facial disk, the forward sitting of the eye, the soft plumage, and the beautifully blended unobtrusive colours, at once distinguish an owl." As is commonly the case with raptorial birds, the female exceeds the male in size, but does not otherwise differ. Most owls are arboreal, roosting during the day in some umbrageous tree. Others frequent rocks, or holes in river banks, and all lay obtusely oval white eggs.

#### STRIGINÆ (Screech Owls).

*Strix Javanica*, Gmel.  
Hnet-soh.

The whole of Burma, but rare in  
Tenasserim, according to Hume.

A very widely-spread species, if Mr. Sharpe is correct in uniting, as Hume says, almost all the 'barn-owls' of the world under one name. In support of this Mr. Hume declares he can detect no difference between Indian and Javan birds.

*S. candida*, Tickell.

Toung-ngoo. India. Australia, etc.

This owl is a favourite object of pursuit with falcons in the Punjab, giving a long chase and fine sport.

*Phodilus badius*, Horsf.  
*Syrnium indranee*, Sykes.  
*S. ochrogynus*, Hume.  
*S. selcputo*, Horsf.

Arakan. Tenasserim. Borneo, etc.  
Pegu. Tenasserim. Ceylon. Malacca.  
Pegu. Tenasserim. Nicobars.

#### ASIONINÆ (Horned Owls).

*Brachyotus accipitrinus*, Pall.  
*Otus brachyotus*, Gmel.

Toung-ngoo. Arakan.

#### BUBONINÆ (Eagle Owls).

*Urua bengalensis*, Franklin.  
*U. coromanda*, Latham.

Arakan.  
Arakan.

Mr. A. Anderson describes some *spotted* eggs of this species taken by himself from the deserted nest of a *Mycteria australis*, shooting one of the parent birds off the nest. "The markings consist of indistinct lilac blotches, showing through the shell, as it were, on of course a pure white ground; and they are both *profusely* though *minutely spotted*, especially at the obtuse end, with brown and lilac spots (or rather specks) of various shades" (Proc. Zool. Soc. Lond. 1876, p. 316).

*Bubo nipalensis*, Hodg.  
*Ptiloskelos Amherstii*, Tickell.

Toung-ngoo (Ramsay).

Hume considers this species, based by Tickell on a young bird from Mooleyit, as a synonym of *B. orientalis*.

*B. orientalis*, Horsf.

Tenasserim (rare).

A hill and forest species.

*Ketupa ceylonensis*, Gmel.

Arakan. Tenasserim. Palestine.

Di-dök.

This is a fishing owl, eating both fish and crabs.

*K. javanensis*, Less.

Arakan. Pegu. Tenasserim. Malacca.



The lesser-eared Owls.

*Scops. PENNATUS*, Hodg. Pegu. Martaban. Camorta (rare).  
*S. sulaia*.

Zi-kwet (gen.).

At Palphoon and Mooleyit this species seems far from rare, but Davison says it is seldom seen.

*S. BALLI*, Hume. Andamans.  
*S. SAGITTATUS*, Cass. Mooleyit and Malewōn (rare).  
*S. LEMPIGI*, Horsf. Pegu. Palphoon. Tenasserim.  
*S. lettia*, Hodgs. Arakan. Tenasserim.

Lord Warden refers the supposed Burmese examples of *S. Lempiyi* to this species. Hodgson's species is of course the *Himalayan* race, and Horsfield's the *Javanese*; but as both species run into each other, Hume is no doubt justified in his proposal to unite them (S.F. vi. p. 36). Some continental naturalists have, however, it would seem (*l.c.*), applied Horsfield's name to a very different bird, *S. magicus*, from Java and Celebes.

SURNINÆ (Twilight Owls).

These Owls have no 'horns' or 'ear tufts,' and are more diurnal in their habits than the other members of this family. Some of them Jerdon remarks are a near approach in appearance to the diurnal Raptores, and Kaup describes their skulls as round and brain large, with small pneumaticity.

*GLAUCIUM RABIVTUM*, Tickell. Tenasserim (*vide* Tickell).  
*G. CASTANOTERUM*, Horsf. Tenasserim (*vide* Haffer).

Hume strongly doubts the occurrence of the Javanese species in Burma, and quotes Temminck's text (S.F. vi. p. 37) to help towards its recognition.

"This little owl is well characterized and easily recognizable by the fine purplish chestnut colour of the back, wings, and tail; the entire head, nape, the sides and front of the neck and breast, are regularly and narrowly banded transversely with brown and dull yellow; the sides and flanks are coloured like the back, and purplish spots occur on the thighs; the whole of the rest of the lower parts is pure white; large white spots occupy the outer webs of the scapulars and some of the coverts near the fold of the wing; reddish yellow bands occur on the quills, and there are five narrow bands of this colour on each of the tail feathers, which are also tipped with it.

"Total length 7·67 to 8·2 inches." Temminck, pl. col. 98, text.

*G. FULCHRUM*, Hume. Pegu.  
*G. Brahma*, Tem. (auctorum from Burma).

Hume has separated the Burmese race, from its much smaller size and other differences (S.F. i. p. 469).

Mr. Oates describes it as "the noisiest of all the small screech owls. They are continually quarrelling with each other at night, and even in the daytime a pair will commonly come out of some hole in a tree and screech away for a quarter of an hour."

This little owl is made use of to catch other birds with. A live one is fixed near a bush which is well smeared with birdlime. Directly its presence is perceived, it is immediately surrounded by whatever birds may be near, all animated with rage towards the captive, and many alighting on the limed bush are easily taken. Jerdon says this plan is pursued in Italy and the South of Europe as well as India.

*G. CUCULOIDES*, Vigors. The Himalayas. Arakan and  
*G. Whitleyi*, Blyth. Tenasserim (rare south of Tavoy).

Zi-kwet.

Hume, with a very large series of both Indian and Burmese birds before him, unites these two species.

*G. BRODIEI*, Burton. Tavoy. Mooleyit.

Davison shot one of these birds with a fledgling *Megalaima* in its claws, being attracted by the outcry raised by the parent of the sufferer.

*Ninox hirsutus*, Tem.

Nicobars.

*N. scutellatus*, Rafll.

Arakan (Tenasserim).

Khin-bōk.

*N. alpinis*, Tytler.

Andamans. Nicobars.

Nearly allied to *scutellatus*, Rafll., according to Hume.

*N. BERNANICA*, Hume.

Under the last-named species, *N. scutellatus*, Blyth would seem to have ranged the Tenasserim race, which has been since separated by Hume. If Hume's species is rightly separated, it is probable that both meet in Arakan.

*N. obscurus*, Hume.

Andamans. Nicobars.

### Order PSITTACI.

The Parrots have the upper jaw articulated with the frontal bones by a complete hinge-joint. In the forest parakeet the margins of the bill are beset with tubercles, under each of which is a gelatinous pulp like that of a tooth (Pascoc). This is a remarkable indication of relationship to those extinct orders of birds whose bills were furnished with teeth. The bill is used as a prehensile organ in climbing, and the feet as hands for grasping and conveying anything to the mouth. Parrots are monogamous, and breed in holes of trees and banks, laying several white blunt eggs. The order embraces one family only.

#### Family Psittacidæ.

This family is subdivided into *Psittacinæ*, or true Parrots; *Loriinæ*, or Lories; *Palæorninæ*, or Parrakeets; *Platycecinæ*, or Australian Parrakeets; *Arainæ*, or Macaws; *Cacatuinæ* and *Nestorinæ*, the Cockatoos and Dusky Cockatoos of Australia; and the *Strigopinæ*, represented by a single species, the New Zealand *Strigops*, an owl-like bird of nocturnal habits.

#### PALEORNINÆ.

*PALEORNIS EUPATORIUS*, L.

Pegu. Tenasserim. Andamans.

*P. magnirostris*, Ball.

The Andaman bird has been separated by Mr. Ball for the largeness of its bill, and Mr. Hume considers the Tenasserim race as identical, though not quite the size of typical *magnirostris*. Blyth remarks that this species in Burma is confined to the higher hills, but this seems doubtful.

*P. ERYTHROGENYS*, Blyth.

Andamans. Nicobars.

*P. Nicobaricus*, Gould.

*P. caniceps*, Blyth (nomen auctore).

*P. affinis*, Tytler.

*P. Tytleri*, Hume.

Davison observes: "It is curious that the bills of all the young of these two species (*P. erythrogenys* and *P. affinis*) that I examined were quite red, both upper and lower mandibles. The adult females always have the bills black. I must have seen during my stay at the Andamans and Nicobars at least thirty young birds of these species, of all sizes, in their nests, with convicts, or in Nicobarese huts, and yet I never saw a young one, that could not fly, that had a black upper or lower mandible" (S.F. ii. p. 184).

*P. TORQUATUS*, Bodd.

Pegu. Tenasserim.

A bird of the open country.

*P. CYANOCEPHALUS*, L.

Pegu. Tenasserim.

A forest species, replacing in Burma *P. rosa*, Bodd., of India and Ceylon (Blyth),

or whatever the species may be called, as Lord Walden says *P. rosa* strictly applies to the Bengal race.

*P. CANICERS*, Blyth.

Great Nicobar. Montschall. Kondul.

*P. SCHISTICEPS*, Hodg.

Arakan. Young-ngoo.

*P. Finschi*, Hume.

The Young-ngoo race has of course received a name from Hume, though neither Walden nor Blyth differentiate it specifically.

*P. VIBRISSA*, Bodd. apud Blyth,

*P. Lathamii*, Finsch ♂ (red bill).

*P. melanorhynchus*, Wagler. ♀

Arakan. Pegu. Tenasserim.

Blyth says: "An exceedingly common species in the forests of British Burma, and Mason remarks of it (in particular) that 'immense flocks of Parrakeets may be seen simultaneously descending on the rice-fields, where persons have to be in constant attendance to drive them away during the season of harvest;' while of *P. torquatus* he notices that it is 'often seen in the rice-fields, but in smaller companies, which have not the habit of simultaneous descent.' Westward, the present species is common in the Terai region of the E. Himalaya, but its range does not extend further into India, whence its synonym of *ponticerranus* is a misnomer. Great numbers of the very young are brought every season to Calcutta from Chittagong, and it is remarkable that from the earliest age the males only have the upper mandible coral-red. In a presumed male<sup>1</sup> which I possessed in captivity, the upper mandible changed from black to coral-red when the bird was about eighteen months old; and I have seen numerous specimens which had been killed when the change was in progress. I have also shot red-billed and black-billed specimens out of the same flock, and therefore cannot admit the *P. nigrirostris*, Hodgson, as a distinct species, differing only in the colour of the upper mandible. Moreover, the same sexual diversity in the colouring of the bill, whether permanently or otherwise, occurs in several kindred species. Rarely, the lower mandible is also red in Burmese specimens, almost constantly so in Javanese examples; but I have been unable to detect the slightest difference of plumage on comparison of skins from Nipâl, Arakan, and Java."

Hume asserts on the contrary that the entire bill in the young of both sexes is black, which may probably be accepted as the rule, but not without such exceptions as have warranted Mr. Blyth in a contrary assertion, though Mr. Hume's superior advantages of observation must give his assertion the greater weight. In *Stray Feathers*, ii. p. 1, Mr. Hume administers an admirable castigation to Dr. Finsch for his flippant and conceited rejection of the testimony of such naturalists as Blyth and Jerdon and others regarding various species of Indian Parrots. On the strength it would seem of a wrongly sexed bird, or perhaps an old female which has assumed the colouration of the male, Dr. Finsch proceeds to show how all Indian zoologists who have asserted that the females have black beaks, must be wrong. Mr. Hume is no doubt severe, but no men are convicted of error by a personal appeal to them to only be kind enough to see it themselves. Mr. Hume says (*l.c.* p. 21), "In the youngest birds that I have seen taken, when just able to fly from the nest-hole, while two birds, one a specimen of *Lathamii* (which I *erroneously conceived* to be the father), with a red copper mandible, and the other a specimen of *melanorhynchus* (which I *erroneously conceived* to be the mother), shrieked round us, which two specimens curiously enough on dissection did prove (unless I *erroneously conceived* the fact) to be respectively male and female, I say these young birds (*hybrids doubtless!*) had both mandibles blackish."

*PSITTINUS INCERTUS*, Shaw.

Tenasserim south of Mergui.

*P. Malaccensis*, Lath.

#### LORIINE.

In the Lories the tongue is furnished with a protrusile tuft of elongated papillae, enabling them to extract the nectar of flowers, which, with soft fruits, constitutes their food.

<sup>1</sup> "Female" in text, error Diaboli?

LORICULUS VERSALIS, Sparrm.

Kyai-the-dā.

Atakan. Pegu. Tenasserim.

This is a forest species of general distribution.

[From the total number of birds known to inhabit Burma, the following may have to be deducted. Namely :

1. *Pellorneum minor* = *P. Tickelli*.

The next seven species may have been confounded with species also enumerated :

2. *Caprimulgus indicus* with *C. jotaka*.
3. *Cypselus latassiensis* with *C. autumnatus*.
4. *Sturnia malabarica* with *S. nemoricola*.
5. *Brachyurus megarhynchus* with *B. molaccensis*.
6. *Cryptolopha Barkii* with *C. tephrocephalus*.
7. *Orthotomus edela* with *O. flavi-iridis*.
8. *Macropygia ruficeps* with *M. assimilis*.

And the total may have to be still further reduced by three more species, namely :

9. *Sturnia sinensis*, its occurrence not resting on good evidence.
10. *Machlolophus subiridis*, apparently *M. spilnotus*, juv.
11. *Brachypodius cinereiventris*, perhaps a variety only of *B. melanocephalus*.

The following four species, not separately enumerated, may have to be added :

1. *Megalama virens*, in addition to *M. Marshallorum*.
2. *Hemircus Hillebrandi*, in addition to *H. flavala*.
3. *Criniger griseiceps*, in addition to *C. flavocolus*.
4. *Osmotreron vernans*.

Further investigations will doubtless make known a great many more forms belonging to either Himalayan or Malayan genera.]—*Walden*.

There are some grounds for supposing that under favourable circumstances Parrots are among the most long-lived of birds. Humboldt records as a fact (Views of Nature, Bohn's Scientific Library, p. 172) that an old Parrot lived in Maypures, which understood words of the extinct tribe of the Atures, by whom he had been reared as a nestling, which curious fact (if it be one) is prettily preserved in the following verses by Professor Ernest Curtius, tutor of Prince Frederick Wilhelm of Prussia, now the present venerable Emperor of United Germany.

Where, through deserts wild and dreary  
Orinoco dashes on,  
Sits a Parrot old and weary,  
Like a sculptured thing of stone.

Through its rocky barriers flowing,  
Onward rolls the foaming stream ;  
Waving palms on high are glowing  
In the sun's meridian beam.

Ceaselessly the waves are heaving,  
Sparkling up in antic play ;  
While the sunny rays are weaving  
Rainbows in the feathery spray.

Where yon billows wild are breaking  
Sleeps a tribe for evermore,  
Who, their native land forsaking,  
Refuge sought on this lone shore.

As they lived, free, dauntless ever,  
So the brave Aturians died ;  
And the green banks of the river  
All their mortal relics hide.

Yet the Parrot, ne'er forgetting  
Those who loved him, mourns them still ;  
On the stone his sharp beak whetting,  
While the air, his wailings fill.

Where are now the youths who bred him,  
To pronounce their mother tongue ;  
Where the gentle maids who fed him  
And who built his nest when young ?

All, alas ! are lifeless lying,  
Stretched upon their grassy bed ;  
Nor can all his mournful crying  
E'er awake the slumbering dead.

Still he calls with voice imploring  
To a world that heeds him not ;  
Nought replies but waters roaring ;  
No kind soul bewails his lot.

Swift the savage turns his rudder,  
When his eyes the bird behold ;  
None e'er saw without a shudder  
That Aturian Parrot old !

## MAMMALIA.

THE following brief remarks are prefatory to Dr. Mason's Chapter on Mammalia, and give a good idea of his popular style of writing :

" Few are aware of the great difficulty that exists in ascertaining the species, and occasionally the genera, of animals in an unexplored country, as this was a quarter of a century ago. At that time the ' rusa ' deer was according to some authorities a ' wild cow,' and according to others an ' elk.' The ' paradoxure ' a ' racoon.' The Bamboo-rat, a *mole*. The ' wild hog,' a *barbyrussa*. The gymnura, an *opossum*. The ' wild dog,' a *wolf*. The leopard, a *cheetah*. A deer, the *nylgau*. The goat-antelope, a *wild sheep*, and we had a goat with one horn resembling the celebrated unicorn. . . . In those days the jungle traveller was entertained at evening by the natives around the bush-fire with wonderful descriptions of the extraordinary animals that peopled the surrounding forests. One was found exactly like an elephant, but never had tusks, and was banded across the body with white. This proved to be the tapir. Another had a skin like a cow, a mane like a horse, and horns like a goat—the goat-antelope. The third was half a dog and half a hog—the sand-badger. A fourth was represented as in a transition state towards a monkey, just such an animal as would certainly become a monkey in the next transmigration. This was the loris. And a fifth had the breasts of a woman, the head of a quadruped, the tail of a fish, and uttered, when captured, plaintive human cries, quite a new variety of the mermaid, which turns out to be the dugong. After Mr. Blyth became the Curator of the Museum of the Asiatic Society of Bengal, by far the greater proportion of the Mammalia of the country fell under his eye, and to him we were indebted for much of our knowledge of species."

### Class MAMMALIA.

Warm-blooded vertebrata, more or less covered with hair, breathing by lungs, viviparous, and the young nourished by a lacteal secretion furnished by the mother. The skull is articulated by double condyles.

#### A.—LISSENCEPHALA.

Cerebral hemispheres with a few folds, and not covering the cerebellum and olfactory lobes.

#### Order BRUTA.

Teeth in many species entirely wanting. Molar teeth when present not displaced by a second series, and without enamel or complex roots. Claws large.

#### Family Manidæ.

No teeth. Body covered with horny imbricate plates. Tail long. Tongue cylindrical and highly exsertile. Food insects, chiefly ants.

MANIS, *Linnaeus*.

The scaly ant-eater or Pangolin. Then-khwac-ghyat (generic).

*M. aurita*, Hodg.

15 to 18 longitudinal rows of scales on the trunk, and 16 to 20 plates on the mesial line on the tail. The middle fore claw nearly twice as long as the corresponding hind claw. Colour very dark brown.

Ranges from the Himalayas to Bhamo and Eastern China.

*M. javanica*, Desmarest.

*M. leptura* and *leucura*, Blyth.

Body and tail longer and more attenuated than in its allies. 19 longitudinal rows on the trunk and 30 along the tail. Fore claws not much longer than the hind. Colour dark olive-brown.

Ranges from Arakan to Mergui, and from Silhet to Bhamo, and the lower spurs of the Kakhien Hills, not ranging so high as *M. aurita*.

Dr. Mason remarks that another species is not rare in the south, which is not characterized by a whitish tail, and this may be, as Blyth suggests, *P. aurita*, Hodgson. Another doubtful species is recorded by Mason. "The Bghais describe a second species, small and thin, which they call Yô-be-hpyu, or small thin pangolin. It is very desirable these species should be correctly ascertained. They lap water freely, and one that was sent to Mr. Blyth alive, ate heartily of a mess of chopped meat and egg and boiled rice. The Burmians believe that this creature has the power of calling persons by name, from the jungle. If the person so called answers, he will die within the year."

## Order RODENTIA.

The rodents are chiefly characterized by their teeth. The incisor teeth or rodentia tusks (really homologous with the canine teeth of other animals), have a thin layer of enamel in front, often coloured yellow or brownish, supported by a thicker layer of dentine, softest anteriorly, so that the tooth is always kept with a sharp chisel edge, by the wearing away of part behind. They are prolific animals, and construct nests, like birds, for the reception and security of their progeny, which attain maturity in a year or less.

## Family Sciuridæ.

Habits arboreal. Tail bushy and long. Clavicles perfect.

SCIURES, *Linnaeus*.

L.  $\frac{3}{4}$ ; R.T.  $\frac{2}{3}$ ; P.M.  $\frac{1}{2}$ ; M.  $\frac{1}{4}$ .

*S. giganteus*, MacClelland.

*S. macruroides*, Hodg.

The large black squirrel. Lē-hyuk.

Colour above, black or blackish-brown. Beneath, and inside the limbs, fulvous white. A black cheekband. Cheeks fulvous grey, with a large triangular patch. A rusty red spot between the ears, which are sometimes densely tufted.

Head and body 15 inches; tail 16.

There is, remarks Blyth, a local race in Tenasserim with a broad pale band across the loins forming a kind of cineture.

Ranges from Sikkim into Burma as far south as Tenasserim.

*S. ferrugineus*, F. Cuv.

*S. Finlaysoni*, Horsf.

*S. Keraudreni*, Reynaud.

*S. Germani*, A. M. Edw.

*S. Bocourti*, A. M. Edw.

*S. leucogaster*, A. M. Edw.

*S. splendidus*, Gray.  
*S. cinnamomeus*, Tem.  
*S. Siamensis*, Gray.  
*S. splendens*, Gray.

The above are the synonyms of the diverse-coloured squirrel, according to Dr. Anderson. The colours vary from deep maroon-chestnut to red, and from grey-grizzled to intense black and pure white, and white spotted or piebald. *S. Germani* is black. *S. Finlaysoni* is white. *S. Bocourti* is piebald. All the others are rich red squirrels. *S. leucogaster* and *S. Siamensis* are young animals. *S. Kraudreni* has a white tail tip. "The appearance of the white," remarks Dr. Anderson, "on this portion of the tail, would seem to indicate that there is an inherent tendency to the production of that colour, probably explicable on the theory of reversion, because the young of many squirrels, when born, have their tails white. This colour disappearing with age."

Ranges from Assam throughout Burma and Siam.

*S. LOKRIOIDES*, Hodg.  
*S. Assamensis*, MacClell.  
*S. Blythii*, Tytler.  
*S. similis*, Gray.

Colour rufous olive-brown. The base of the hairs greyish-black, and their remainder banded yellow, black and yellow, and brown or blackish-tipped. Throat and belly greyish or sullied white, tinged more or less with rufous, but never with bright orange, as in *S. lokriah*. Tail similar to the back, but the hairs more coarsely annulated.

This species ranges into Arakan and Prepara Island, and stretches from Nipal to Western Yunnan.

*S. LOKRIAN*, Hodg.

Colour deep ferruginous olive-brown. Belly rich orange. The bands on the hair are orange, not yellow as in *S. lokrioides*, and the terminal black tip to the tail is broad, but tipped with orange or white. A white tuft behind the ear.

From Nipal to Assam, ranging into Arakan.

*S. ATRODORSALIS*, Gray.

Colouration of two types. In the paler type, the back and the feet are yellowish rufous, the top of the head orange red, and the under surface and the inside of the limbs chestnut. Tail ringed orange and black, the former colour being terminal. In the other type the back is black, with generally, but not always, white whiskers. Head and body 8·9; tail 10·25=19·15 inches.

Mr. Blandford remarks, "I have only seen *S. atrodorsalis* from the northern portion of the Tenasserim provinces, the species has not yet, so far as I am aware, been recorded from Mergui or Tavoy, nor is it known to occur west of the Salween River. It abounds around Maulmain and Amherst, and in the valleys of the Hougdarau and Attaran Rivers."<sup>1</sup>

*S. RUFIGENS*, W. Bl.

This squirrel is nearly the same size as *S. caniceps* and *S. atrodorsalis*, but the tail is much shorter, its length, without counting the hairs at the end, being always considerably less than that of the head and body; it is distinctly distichous below. Fur soft throughout.

Upper parts dark olive, frizzled, cheeks ferruginous, a small white spot behind the ear, lower parts white, tail hoary, black with white rings and tips above, chestnut below.

The colour of the back and sides resembles that of specimens of *S. caniceps* in which there is no yellow or rufous tinge, being a fine mixture of black and pale

<sup>1</sup> "Error is proverbially immortal, and consequently, attention cannot be too frequently called to the circumstance that the localities assigned to this species and to many other Asiatic squirrels in Dr. Gray's lists are incorrect."

yellow, the sides rather paler. The fur on the back, as in several allied species of squirrel, is of two kinds, the finer and shorter hairs being dark leaden colour at the base, pale yellowish grey at the tips, and about a quarter of an inch long in the middle of the back, the longer hairs are coarser, about half an inch long, and black with a pale yellow ring near the end, the tips being black. As usual the longer hairs are most abundant near the middle of the back, less so on the sides. Forehead rufous mixed with black, the sides of the head are dark ferruginous above, paler below, shading off gradually into the colour of the face and throat. Ears rounded, covered thinly inside and out with short hairs; a little patch of silky white hair behind each ear is concealed by the ear cone when the ears are laid back. Whiskers black. The hairs of the lower parts are dark grey at the base, white at the ends, there is a tinge of rufous on the fore neck and throat in some specimens. Fore limbs yellowish olive outside, like the sides, whitish inside, hind limbs also whitish within, but more rufous outside. Tail clad above with black hairs, having a white ring near, but not at their base, and white tips, so as to produce a very beautiful hoary appearance, lower surface of the tail chestnut, the longer hairs on the sides with black and white tips.

None of the other Burmese or Himalayan squirrels resemble the present form, nor am I acquainted with any Malay species with similar colouration. The nearest approach is perhaps made by *S. Pernyi*, found at Sechuen in China. This species has a yellow spot behind the ear, the lower surface of the tail is ferruginous, and the belly white, but it wants the ferruginous cheeks, it has no white tips to the hairs in the upper surface of the tail, and it is more rufous above, the latter character being, however, of little or no importance.

The Himalayan *Scurus lokriah* also possesses, I find, the small whitish tuft behind the ear, though less developed than in *S. rufigenis*; the colouring of the lower parts and tail are, however, conspicuously distinct in the two forms. The presence of the white spot in *S. lokriah* affords an excellent character for distinguishing this species from *S. lokrioides*.

*S. PYGERYTHRUS*, Is. Geoffr. St.-Hilaire.

Back and basal third of tail dark olive-grey. The rest of the tail ringed yellowish and black, and black-tipped. The nuder parts yellowish. The feet either yellowish or like the upper parts. The hairs of the back are banded dark and yellow.

Pegu and Upper Burma, where the colouration is paler than in the Southern form.

*S. PHAYREI*, Blyth.

*S. hyperythrus*, Blyth.

Resembles *S. pygerythrus* above, but lower parts are rich orange red, which extends beneath the tail. Mr. Blanford remarks: "This species, as noticed by Blyth, is only known to occur west of the Salween. It is not, so far as I am aware, found west of the Sittoung; in the Irrawaddy Valley in Pegu, it appears to be replaced by *S. pygerythrus*, whilst further north, around Ava, it is represented by the closely allied *S. Blanfordi*, into which it doubtless passes. *S. Phayrei*, Mr. Davison tells me, is found north as far as Pah-Khyoung at the southern extremity of Karen-ni (the country of the Red Karens).

"The following are dimensions of a female from Thaton:

"Length—head and body 9·6; tail 11·2=20·8 inches."

*S. BLANFORDI*, Blyth.

Fur above grey, finely punctulated with black and grey. Tail grey, black-tipped. Hands and feet yellow. Below pale orange-yellow.

Toung-ngoo and Upper Burma.

*S. GORDONI*, And.

Upper surface and a narrow line along the sides grizzled olive-brown or greyish. The chin and sides of throat paler. The chest, belly, and inside of limbs are either pale yellow or orange-yellow. The ears are faintly pencilled. End of tail blackish with yellow tip.

Head and body 9 inches; tail 7 inches.

Upper Burma.



*S. SIABENTI*, And.

Closely allied and of the same size as *S. Gordoni*, but having its feet and head orange-red, and a bright brick-red tail tip.

Thigyain in Upper Burma.

*S. CANICEPS*, Gray.

*S. chrysnotus*, Blyth.

*S. concolor*, Blyth.

Above grey or fulvous. Tail grey, grizzled with an abrupt black tip. Inner side of limbs greyish, sometimes tinged with yellow. Sometimes the nape, shoulders, and back are bright ferruginous. Whiskers long and black. Ears with whitish pencils.

Tavoy and Tenasserim.

*S. BERDMOREI*, Blyth.

*S. Mouhotii*, Gray.

Colour brownish, rufous on the back. Head, sides, and outside of the limbs punctulated with yellow. An obscure black vertebral line behind the shoulders, half down the trunk. A yellow line from the shoulder to the groin bordered above with dusky and below with a broad black band, and below it, a pale yellow linear area. Under parts white, washed here and there. Tail bushy, the hairs annulated with four alternate orange and black bands.

Head and body 7·75 inches; tail 5.

Mr. Blanford seems not quite satisfied as to the union of these species.

"Several skins were procured by Mr. Davison, and a specimen in spirit was collected by Mr. Limborg, of a species of striped squirrel differing somewhat from the Museum specimens of *S. Berdmorei*, but agreeing very well with Gray's description of *S. Mouhoti* from Cambodia. The Museum specimens of *S. Berdmorei*, said by Blyth to have been collected by himself in Martaban, have three broad black stripes along the back, whereas in the specimens before me there are no black stripes and no distinct darker band in the middle of the back, although there is a slight indication of darkening in one specimen. In the original description of *S. Berdmorei*, it was said to have an obscure pale central dorsal streak, flanked by a blackish band, but in a subsequent description of an example sent from Maulmain the three black bands of the back were especially noticed. Subsequently *S. Mouhoti* was described by Gray and then identified by the describer with *S. Berdmorei*, an identification adopted by Blyth. It is possible that the two forms pass into each other, but they look very different, and for the present I prefer retaining Gray's name for the variety before me, of which the following is a description.

"The upper surface is yellowish-brown, punctulated, the hairs being black with two buff rings. The fine woolly under-fur is dark slate-coloured at the base with buff tips. On each side of the back there are two longitudinal pale lines extending from the shoulder to the thigh, the upper narrow and well defined, the lower broader and less marked. Between the two and above the upper pale line, the fur is darker in some specimens, but apparently this is not constant. The sides below the lower pale lateral bands are greyish-brown punctulated. The lower parts throughout are white, sometimes tinged with buff. The tail hairs are light brown at the base, then black, then brown again, then black to near the tips, which are whitish. Whiskers black. The ears are rounded with very short hairs outside.

"The bare planta on the hind feet extends further towards the heel than in the more typically arboreal squirrels, *S. caniceps*, *S. atrodorsalis*, and *S. Phayrei*, in which the bare portion ends about  $\frac{1}{2}$  to  $\frac{3}{4}$  of an inch from the proximal extremity of the tarsus, whereas in *S. Mouhoti* it extends to the joint. The claws too in *S. Mouhoti* are rather less curved, and the pads on the feet appear more raised."

Length of adult female—head and body 7·3; tail 5·8; total 13·1 inches.

Martaban and Tenasserim (where rare).

*S. MACCLELLANDII*, Horsfield.

*S. Pembertonii*, Blyth.

*S. Barbei*, Blyth.

Olive-brown, each hair having a dark-brown or blackish tip, a subapical yellow band and a slaty base. A pale yellow band from the nose to the tail, which involves the orbit. This band is marginal above, with a dusky line. A narrow black vertebral line from the shoulders to the tail. Ears end in a distinct white pencil. Under parts dusky yellowish-white, or greyish, washed with yellow.

Ranges from Nipal to Tenasserim and Siam, and is found at Pensee, in Yunnan, at 3500 feet elevation.

*S. QUINQUESERIATUS*, And.

Above olive brownish-grey, grizzled and with a rufous tint, deepest on the back. A rufous grizzled blackish brown band along the median line of the belly, and on either side of it a broad pure white band. A broad black band from the axilla along the sides of the belly. Inside of limbs blackish. Tail concolorous with the body (but the annulations coarser) and black tipped.

Head and body 9.50; tail 7.10 inches.

Inhabits the Kakhyen Hills, at 3000 feet, and seems to have a limited distribution.

*S. PREVOSTII*, Desmarest.

*S. Rafflesii*, Vigors and Horsfield.

*S. piceus*, Peters.

*S. rufogularis*, Gray.

*S. rufonigra*, Gray.

*S. erythromelas*, Temm.

*S. atricapillus*, Schl.

*S. borneensis*, Gray.

*Macrosc. Sarawakensis*, Gray.

*M. Pluto*, Gray.

Upper parts black. Tail black with red tip. Below rich maroon red. Sides of the face, neck and shoulders greyish. A broad yellowish white line runs from the axilla along the side and over the outside of the thigh to the heel.

Head and body 10.50; tail 10.30; total 20.80 inches.

Sumatra, Borneo, Banka, The Celebes and Tenasserim.

The various local races have received many distinctive names; but Anderson unites all under one species.

#### PTEROMYS, *Cuvier*.

Skin of the sides lax, and capable of extension to form a parachute. Dentition as in *Sciurus*. Tail usually round, like a bottle brush; in some species distichous (*Sciuropterus*).

*P. CINERACEUS*, Blyth.

Fur pale-greyish, mixed with brown, with many white-tipped hairs, which impart a hoary appearance to the surface. Tail whitish, with a black tip. The upper surface of the parachute is reddish-brown, ungrizzled. The under parts are white.

Ranges from Arakan to Tenasserim, where it replaces *P. oral*.

*P. YUNANENSIS*, And.

Colour a rich dark maroon chestnut above, freckled with white, and posteriorly rather hoary. The terminal portion of the tail is glossy black. Under surface yellowish white, sometimes mesially tinged with chestnut.

Body 24; tail 24 inches.

Inhabits Teng-yue-chow in Yunnan.

*P. ALBONIGER*, Hodg.

Back and tail pale brownish-grey. Parachute externally rich brown. Fur slaty at its base, then brown, and terminally yellow, with an occasional brown tip.

From Nipal to Burma and Western Yunnan.

*P. HORSFIELDII*, Waterhouse.

*P. aurantiacus*, Wagner.

*P. Phayrei*, Blyth.

Upper parts and tail rich uniform rufous brown. Tail below bright rusty, bushy and distichous. Sides of the face and margin of the parachute reddish yellow; dorsal surface of parachute dark brown. Below yellowish white, the hairs without a dark base. The hairs of the upper parts with a grey basal portion.

Body 9.00; tail 8.25 inches.

Ranges from the Malayan Peninsula into Tenasserim.

*P. SPADICEUS*, Blyth.

Above bright rusty bay, below white, with the parachute, limbs and tail dusky. The terminal third of the tail pale rufous.

Body 5.0; tail 4.25 inches.

Inhabits Arakan.

### Family **Muridæ.**

Much, very much has yet to be done before any clear notion of the number of species of these perplexing animals can be arrived at. Flat and dried skins are next to useless for discriminating between allied species, and the animals should be preserved in spirits for the examination and comparison of a large series.

Under the heading of "White-bellied Rat," Mason remarks that "the Rats are scarcely second to the Termites for the mischief they perpetrate. They burrow in the gardens and destroy the sweet potatoes; they make their nests in the roofs by day and visit our houses and larders by night. They will eat into teak drawers, boxes, and book-cases, and can go up and down anything but glass. In the province of Toung-ngoo they sometimes appear in immense numbers before harvest and devour the paddy like locusts. In both 1857 and 1858 the Karens on the mountains west of the city lost all their crops from this pest; and it is said that they are equally destructive occasionally in the eastern districts, but have not appeared for several years. The natives say it is the same Rat as the one that frequents houses."

Again, he remarks that Mr. Cross, when on the Tenasserim river a few months ago (in 1858), wrote—"The people, in common with all who grow the hill paddy, over an extent of country more than fifty miles square, are suffering a famine of rice. This is occasioned by swarms of Rats, which devoured the paddy, or rather cut down the stalks, just as the ears began to fill. The Rats twice visited some parts of this territory during the season, so that scarcely a stalk of rice escaped them. I met with two of these animals, swimming the Tenasserim where it is more than a quarter of a mile wide, and succeeded in capturing one. The animal is about five inches from the nose to the end" (base?) "of the tail, of a slim and nimble appearance, the belly white, and the rest a mouse colour. During the rains, when the river is much wider and more rapid, these Rats crossed in columns, as the people say, so abundantly that a boat, in passing through, caught bushels of them. They only make their appearance at long intervals, like the locusts of other places. It is said to be from twenty to thirty years since they visited the country before, to any great extent."

It would be out of place to attempt in a work like the present any account of the synonymy of the Burmese species of *Mus*, but some of the principal ones are extracted from a copy of Blyth's memoir of the rats and mice of India, in my possession, corrected by the author, and six new species added, collected by Anderson in Yunnan.

### *Mus*, *Linnaeus*.

*M.* (*NESOKIA*) *INDICA*, Geoffroy.

*Arvicola indica*, Gray (Hardw. Ill. Ind. Zool.).

*Mus* (*Neotoma*) *providens*, Elliot (Mad. Jour. Lit. Soc. 1839, p. 209).

*Mus* *Kek*, Gray (Mag. Nat. Hist. 1837, p. 585).

*Mus* *Hardwickii*, Gray (*idem*).

*Mus* *pyctoris*, Hodgson.

*Nesokia Griffithi*, Horsfield (Moore's India House Cat. Mamm.).

This is the type of Gray's genus *Nesokia*, whose chief claim to separation would seem to be based on its somewhat more powerful incisors and a fancied resemblance

in aspect and habits to *Rhizomys*, which Blyth, who has studied both animals during life, declares his inability to see. It is not certain if this animal ranges into Burma, though Blyth remarked on the probability of its occurrence in the dry region of the Upper Irrawaddy, and I referred to it a pair taken beneath my house at Toung-ngoo, which measured—Male, head and body 9·75; tail 7·25; total 17 inches. Female, 8·5 and 6; total 14·5. Blyth remarks he has never seen the tail more than 5·5 inches, but as the animals were large and old ones, they could not have been ‘Bandicoots,’ and there is no other species which it resembles. The female above noted had besides 16 mammae.

*M. BANDICOOTA*, Bechstein.

*M. g. gauticus*, Hardwicke.

*M. perchal* (Pennant), Shaw.

*M. malabaricus*, (Pennant), Shaw.

*M. nemoricagus*, Hodgson (Ann. Mag. N. H. 1845, p. 206).

*M. (Neotoma) giganteus*, Elliot (Mad. Jour. Lit. Soc. 1839, p. 209).

*M. setifer*, Horsf. (nec apud Cantor).

The ‘bandicoot’ or pig-rat. Myae-kywet.

The occurrence of this rat in Burma rests on Mason’s authority, who gives the above vernacular name for it, but no details, and as it occurs in Siam and the Malayan Peninsula, it may not improbably occur in Burma likewise. Hardwicke describes a female as measuring—Head and body 13·5; tail 13·0; total 26·5 inches, and weight 2lbs. 11½oz. and the males attain 3lbs.

Good Burmese specimens of both the above species are wanted to establish correctly their range and distribution.

*M. DECUMANUS*, Pallas.

*M. Norvegicus*, Balton.

*M. decumanoides*, Hodg. apud Gray (nec Waterhouse, nec Horsfield).

*M. brunneus*, Hodg. Gray (nec Blyth).

The common brown rat.

Colour above dusky, cinereous brown with a yellow tinge. The short hairs slaty at base with yellow tips, the longer hairs blackish. Below dirty pale ash.

Head and body 10·5 inches; tail 8·25; total 18·75.

Introduced at the ports by ships, whence it has spread into the interior.

*M. ANDAMANENSIS*, Blyth (J. A. S. B. xxix. p. 103).

*M. Nicobaricus*, Scherzer? (Zool. Novara Exp.).

*M. setifer*, Horsf. (apud Cantor).

Colour and ears much as in *M. decumanus*, but the fur darker on the back and paler on the sides; the long piles being flattened and spinous.

Head and body 8 inches; tail 8; total 16 inches.

The indigenous rat of the Andaman Islands.

*M. CAUDATOR*, Hodgson.

*M. cinnamomeus*, Blyth.

Colour bright cinnamon, with inconspicuous black tips, and below white, the two colours abruptly divided.

Length—head and body 6; tail 7·75; total 13·75 inches.

Inhabits the Sittoung Valley. (Shwe-gyeen.)

*M. ROBUSTULUS*, Blyth (Jour. As. Soc. B. xxviii. p. 294).

*M. rufescens* (Auctorum, of Burma).

*M. Berdmorci*, Blyth? (Jour. As. Soc. B. xx. p. 173).

Colour dark grey, scarcely rusty, with much black intermixed. Fur coarse and hispid. Feet and belly white. Rodentia tusks yellow. Tail thinly clad. Mammae 12. Inhabits Pegu and Tenasserim.

A large male from Rangoon measured—

Head and body 7·20; tail 7·20; total 14·40 inches.

*M. BOWERSII*, And.

Uniformly grizzled blackish-brown above, paler on the sides. Feet, tail tip, and belly pale yellow; the pale and dark colouration distinctly defined. Feet strong. Claws short and strong. Pads well developed. Ears ovate. The last molar consists of a broad anterior fold and a small one behind it.

Head and body (female) 9·00; tail 10·26=19·26 inches.  
Hotha at 4500 feet.

*M. SLADENI*, And.

Reddish-brown, many of the hairs with broad yellow tips. Cheeks greyish-rufous. Throat and chest white. Belly and under parts yellowish-white. Feet and pads well developed. Ears large and rounded. Claws somewhat long and sharp.

Head and body (female) 6·30; tail 7·20=13·50 inches.

Burma and the Kakhyen Hills at 3500 feet.

This species is closely allied to *M. nitidus*, Hodg., but has a less elongated skull, shorter nasals, and a more abrupt frontal contraction.

*M. RUBRICOSA*, And.

Above dark rusty brown, paler on the head and shoulders. Sides tinged with grey. All the under parts silvery white verging to grey, with a faint yellowish hue. Ears small and pointed. Hind feet long and narrow. Claws sharp. The skull is distinguished from that of *M. Sladeni* by its elongated nasals, which reach back to behind the posterior border of the supraorbital foramen, while in *M. Sladeni* the nasals barely project behind its anterior border.

Head and body (male) 5·70; tail 5·15=10·85 inches.

Inhabits houses at Pensee and Hotha.

*M. YUNANENSIS*, And.

Above dark rich brown, with intermixed pale hairs with broad brown tips. All the under parts yellowish, marked with rufous. Ears large and rounded. Claws compressed, curved, strong and sharp.

Head and body (female) 5·45; tail 6·15=11·60 inches.

Inhabits Pensee and Hotha.

This is the common house rat of the country. Its skull resembles that of *M. Sladeni*, but has a shorter muzzle.

*M. CONCOLOR*, Blyth.

Common small thatch rat.

Colour rusty brown above, paler below.

Inhabits Pegu and Tenasserim.

"This species conducts from the long-tailed arboreal rats to the ordinary house mice" (Blyth).

*M. BADIUS*, Blyth.

Colour above rufous chestnut, below white.

Resembles *M. oleraceus* of India, "but the eye fully twice as large, and black whiskers" (Blyth).

A female from Schway-gyeen measured—head and body 3; tail 4½ inches.

*M. PEGUENSIS*, Blyth.

Colour pale fulvescent olive-brown above, slightly yellowish-white below. Fur full and dense. Tail well clad. A field mouse.

Head and body 3½; tail 3½; total 7 inches.

"A particularly well distinguished species, of which there is an unmistakable specimen marked from the Philippines, in the Derby Museum, Liverpool" (Blyth).

*M. URBANUS*, Hodg. (Ann. Mag. N. H. 1845, p. 269).

*M. dubius*, Hodg.

*M. musculus*, apud Elliot and Kelaart.

*M. Mawei*, Gray (undescribed).

The common house mouse of India.

Colour above embrowned, ruddy luteous, below luteous, more or less rufescent. Head and body  $2\frac{3}{4}$ ; tail  $2\frac{3}{4}$ ; total  $5\frac{1}{2}$  inches. Resembles the English mouse (*M. musculus*), but has smaller ears, larger eyes, narrower paws and the tail one-fourth longer, measuring 3 inches in *M. musculus* and 4 in *M. urbanus*. Has been received from Port Blair, where doubtless introduced.

*M. NITIDULUS*, Blyth.

Colour as in *M. decumanus*, with the under parts subdued white, tolerably well defined. Rodentia tusks conspicuously larger than in *M. musculus* or *M. urbanus*.

Head and body 3.25; tail 3.25; total 6.50 inches.

Type from Schway-gyeen.

*M. KAKHYENSIS*, And.

Fur long, dense, and soft, reddish-brown above, with a speckled appearance due to the stronger hairs having brown tips. Under parts silvery greyish white. Ears brown. Tail brown, paler below. Ear large and rounded. Claws compressed, curved, and sharp.

Head and body (female) 2.90; tail 3.36=6.26 inches.

Ponsee, in the fields.

This species differs from *M. urbanus* by its relatively shorter tail and larger ears. The nasals too are more elongate, and carried farther back than in *M. urbanus* or *M. homurus*.

*M. VICTORUM*, And.

Fur short, soft and dense, dull dark-brown, tending to blackish on the back, and passing into pale dusky brownish below. Ears and tail brown. Toes with shining greyish yellow hairs. Ears somewhat large, rounded. Claws compressed, moderately long and sharp.

Head and body (female) 2.90; tail 3.14=6.04 inches.

Inhabits Ponsee and houses of the Kakhyens.

*M. OLERACEUS*, Bennett.

Rich rufous or chestnut red, paling to brown on the ears and muzzle. The cheeks and under parts white, with a yellowish tinge. Eye rather large. Ear rather large and rounded. Claws short.

Head and body (female) 2.41; tail 3.65=6.06 inches.

From Nipal to Burma.

Anderson describes his specimens as having no "true claw," but only a "flattened nail," on the first and fifth digits, the ungual cushions on which are moreover tuff and rounded and not compressed as on "clawed digits." Three well-distinguished species of mice from the Khasi Hills have also been described: *M. cunicularis*, Blyth; *M. erythrotis*, Blyth, and *M. glyroides*, Blyth (J.A.S.B. xxiv, p. 721).

According to Mason, "There is a water rat throughout the country which burrows in the banks of streams, and takes to the water, when pursued."

*HAPALOMYS*, Blyth.

Limbs short, toes remarkably corrugated beneath, the balls of the ungual phalanges greatly developed, and protruding beyond the minute claws of the fore feet, and equally with the more developed claws of the hind feet. Tail very long, the terminal fourth being remarkably flattened, and furnished with hair more developed than perhaps in any other truly *marine* form. Dentition as in *Mus*, but rodentia tusks broader and flatter.

*H. LONGICAUDATUS*, Blyth.

Fur long and soft, above brown, white below. The hair of the upper parts is for its basal two-thirds slaty, then glistening brown, with black tip. Whiskers long, fine and black. A tuft of fine black hair anterior to the ears.

Head and body (male) 5.75; tail 7.25=13.00 inches.

Inhabits the valley of the Sittoung (Schwagheen).

## Family Spalacidae.

## RIZOMYS, Gray.

Head large, with large rodentia tusks. Body massive. Eye small. Ears naked. Feet short, strong. Tail short, thick, naked. Molar teeth rooted at all ages, "even before they have appeared externally" (Anderson). Burrowers and nocturnal.

*R. CINEREUS*, MacClelland.

*R. Sumatrensis*, Raffles.

*R. dekan*, Temm.

The large bamboo rat. Pwai.

The original name *Sumatrensis* is inapplicable, as the animal has not been found in Sumatra. The native name *dekan* substituted by Temminck is equally objectionable, as, according to Anderson, it has led to the absurd idea of the animal occurring in India ("the Dekkan"), so that MacClelland's name would seem to claim recognition.

This species possesses always the white head spot, and in the young the head is particularly rufous, suggesting, says Anderson, a "general resemblance to that of the nearly allied form *Siphneus*." It grows to about 2 feet in length, of which the tail measures a fourth. This species inhabits the Malayan Peninsula and Siam, and perhaps ranges into Tenasserim.

*R. ERYTHROGENYS*, And.

Allied to *R. Sumatrensis*, but distinguished by its "light red cheeks" and by the "absence of white spots on the forehead." Upper parts dark iron grey, becoming almost black on the top of the head, where it abruptly ceases in a point between the eyes. Lower parts white, more or less tinged with grey, and reddish.

Head and body (female) 14·75; tail 5·35=20·10 inches.

Inhabits Martaban and Tenasserim.

This species is based on a living female from the Salween Valley and a specimen from Tenasserim.

*R. PRINOSUS*, Blyth.

Above brown, grizzled with white. The hairs at their base slaty and many of them white tipped. Under parts similar to the upper, but less grizzled. Ears, nose and feet dusky caraneous.

Head and body (male) 13·00; tail 4·00=17·00 inches. Females are smaller.

Ranges from the Cherra plateau to the Kakhyen Hills and to Cambodia.

The skull of this species, says Anderson, is not only larger than that of *R. badius*, but more expanded and flattened in the frontal region. In the present species also the premaxillaries do not extend behind the nasals, which they do in *R. badius*, and almost embrace their hinder extremities.

*R. BADIUS*, Hodg.

*R. castaneus*, Blyth.

Fur fine, the hair for its basal two-thirds grey, and its terminal third some shade of chestnut, brightest on the head, and dullest on the rump. Muzzle and chin greyish-brown.

Head and body 7·00; tail 2·45=9·45 inches.

Ranges from Nipal into Arakan and to the Kakhyen Hills.

*R. MINOR*, Gray.

Allied to the two preceding species, but of a dusky-brown colour, with white muzzle and around the eye, and pale naked feet. Blyth observes: "I obtained a living specimen of this animal when in Upper Martaban, but the skin of it got spoiled; and I at once recognized the same species in two drawings of it as obtained in Siam by Capt. Finlayson. It has likewise been obtained at Yanangeen, on the Irrawaddy. It is even included, together with *R. sinensis*, Gray, in Mr. H. Walker's 'Catalogue of the Mammalia of Assam' (*ibid.* iii. p. 267); but both species are there in need of verification. Mason remarks that 'this animal, which burrows under old

bamboo roots, resembles,' to some extent, 'a Marmot more than a Rat, yet it has much of the Rat in its habits. I one night caught a specimen gnawing a coco-nut, while camping out in the jungles.' According to Mason the Bghais call the Bamboo Rat *K'hai*, and they say that there is the Bamboo Khai, the Reed Khai, the Maranta Khai, and the *W'ie*, a very small species of the same tribe." In *R. Sumatrensis* the fur is thin and bristly. The other three here given are smaller animals, with shorter tail and the fur soft and dense.

The Bamboo Rats are inoffensive animals, seldom seen out of their burrows. Dr. Anderson remarks: "The young are quiet and inoffensive, but the ferine adults, more especially the males, are very fierce, and at once show fight, without thinking of retreating, emitting a peculiar hissing grunt as they charge. The female also, when in company of the young, becomes greatly excited when captured, and I have seen one in these circumstances, when her own young were placed beside her, rapidly kill them off, one after another, as they fondled her and searched for her teats to suck, but on the other hand in confinement I have known an adult female to be perfectly docile."

### Family Hystricidæ.

Dentition, I.  $\frac{2}{2}$ ; R.T.  $\frac{2}{2}$ ; P.M.  $\frac{2}{2}$ ; M.  $\frac{2}{2}$ .

Clavicles imperfect, attached to the sternum only.

HYSTRIX, *Linnaeus*.

The body covered with spines, some stout and rigid, others long and flexible. Tail terminates in a brush of open tubes, of a parchment-like material, supported on slender stalks, which when violently agitated produce a rattling sound.

#### II. BENGALENSIS, Blyth.

Crest small and thin. The body spines flattened, grooved, and terminating in a slight seta. Flexible quills white, with a black central band. Thick quills white towards the base, the rest black, with a white tip. A distinct white gorget.

Head and body 28; tail 8 inches.

Ranges from Bengal into Arakan.

#### H. YUNANENSIS. Andamans.

Very near to *H. (Acanthion) Javanica*, but possessed of a moderate crest, and equally near or nearer to *H. sub-cristata*, Swinhoe, from which Anderson dissociates it on the presumption from Swinhoe's remarks that that species is not an *Acanthion*, as the present one is. Colour dark brown on the head, neck, shoulders and sides, passing into deep black on the extremities. A narrow white line from the gape to the shoulder. Below whitish. In the skull the nasals terminate anteriorly to the orbit, and even before the anterior angle of the external portion of the lacrymal.

The country East of the Kakhyen Hills, between 2000 and 4500 feet.

The porcupines of Burma have not been properly determined, and Blyth only doubtfully refers the common species to *Bengalensis*, and alludes to the probable occurrence of *H. longicauda* also in Tenasserim. Dr. Mason observes, "An individual lately turned up in my compound, and it was amusing to see how the animal defended itself. When pursued, it uniformly rushed into the nearest corner, put down its head, as if it would conceal itself, erected its quills like a hemisphere of spears, and shook together the quills of its tail, which produced a rattling noise in tones of defiance. In that position it seemed fearless of all attacks."

### Family Leporidæ.

Dentition I.  $\frac{2}{2}$ ; R.T.  $\frac{1}{2}$ ; P.M.  $\frac{2}{2}$ ; M.  $\frac{2}{2}$ .

LEPUS, *Linnaeus*.

#### L. PEGUENSIS, Blyth.

Pegu hare. Phu-goung.

Distinguished from *L. ruficaudatus* of India by the tail being black above. Tho



colour of the upper parts contrasts sharply with the white of the belly, instead of grading into it. The fur above is basally dusky-grey, thin, black, and finally fulvous-brown, with black extreme tips (size as in *R. ruficaudatus*).

Inhabits the open country in Northern Pegu.

### Order CHIROPTERA.

The fore limbs with four elongated ulnar digits united by a membranous extension of the integument. Mammæ pectoral.

#### Sub-order MEGACHIROPTERA.

##### *Frugivorous bats.*

Crowns of the molar teeth smooth, marked with a longitudinal furrow. Bony palate continued behind the last molar. Index finger generally terminating in a claw. Pyloric extremity of the stomach greatly elongated.<sup>1</sup>

Frugivorous. Limited to the tropical and subtropical regions of the Eastern hemisphere and Polynesia.

#### Family Pteropidæ.

##### PTEROPUS, Brisson.

Muzzle long, narrow and cylindrical. Upper lip with a vertical groove in front, bounded laterally by naked prominences. Index finger with a distinct claw. Tail none.

Dentition, I.  $\frac{1}{1}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{1}{1}$ ; M.  $\frac{6}{6}$ .

*P. MEDIUS*, Tem.

*P. Edwardsii*, Geoffroy.

*P. leucocephalus*, Hodgson.

*P. Assamensis*, MacClelland.

Len-hwai. The Indian flying fox.

The nape of the neck and shoulders are usually reddish yellow, or golden yellow, or pale straw-colour; the varying colours depending on sex, age and season, females being darker than males. The remainder of the fur is blackish or dark brown, often grizzled with greyish hairs.

Length of a male, head and body, 10·5 inches.

"This large bat has been very appropriately named the "Flying fox," for it bears a strong resemblance to a small fox in everything but its wings. Nor is it very small. Adults measure from three to four feet across the wings from tip to tip. They abound on the coast, and it is quite impossible to keep ripe fruit from their depredations without inclosing it in basket-work." A good description of this animal was given by Lieut. Tickell in the Calcutta Journal of Natural History, who remarks: "It must have been a familiar sight to many to see some huge tree in the centre of a village, on the skirts of a forest, or in the midst of a wide plain, garnished by hundreds of the dangling bodies of these animals. A person stationed near such a spot at the first break of dawn might see the Pteropi come stealing back to their retreat from all quarters. From the arrival of the first comer, until the sun is high above the horizon, a scene of incessant wrangling and contention is enacted amongst them, as each endeavours to secure a higher and better place, or to eject a neighbour from too close vicinage. In these struggles the bats hook themselves along the branches, scrambling about hand over hand with some speed, biting each other severely, striking out, with the long claw of the thumb, and shrieking and cackling without intermission. Each new arrival is compelled to fly several times round the tree,

<sup>1</sup> The descriptions of species of this order are condensed from those contained in the admirable monograph of Asiatic Chiroptera by G. G. Dobson, M.A., F.L.S., etc., London, 1876.

being threatened from all points, and when he eventually hooks on, has to go through a series of combats, and he probably ejected two or three times before he makes good his 'tenure.' The 'alarms' and 'excursions' continue till 8, 9, or 10 a.m., when the bats get sleepy, and hang side by side in peace, fanning themselves with their wings, which in repose they wrap around the head, slumbering with the chin on the breast, and the muzzle covered by the membrane of the last phalanges. The usual noises of a village, in the centre of which they often select their roosting-place, do not appear to disturb them, or to cause further stir, than the production of two or three heads, from within their mantles, which after a look on the houses and people below, and a few rapid tremulous movements of the ears, are again popped into their envelopes. The report of a gun causes dreadful commotion. They rise in clouds from the tree, and continue circling round and round, having to fight their battles over again, when left to settle, and to go through the whole scene, shrieking, cackling and contention of the morning. . . . The flying fox is easily tamed. It will eat or drink from the hand a day or two after capture even when wounded. It drinks eagerly at all hours, lapping milk or water with its long pointed tongue, and it readily learns to eat in the day-time as well as at night. 'Hookey,' as a tame one has been named, has become perfectly familiar, rather fearless than tame, for he attacks the approaching hand, tooth and nail (literally), although he will eat and drink from it. He is accommodated with a high narrow box, having a projecting grating, to which he hangs suspended, endeavouring to grapple all passers, with sound hook or thumb claw (one being broken in capture), to see whether they have any eatables upon them. When angry, he opens his mouth, growling or cackling in the fashion of a monkey, and striking out forcibly with the aforementioned claw or hook. If the contest wax too warm for him, he swings round, and strides back into the box, head downwards all the time, of course." These animals are very cleanly in their habits, and when about to void their excrement, adroitly reverse their position by letting go with their feet and holding on with their thumb-claws, when, as Tickell remarks, there is "with reference to its own head, no further occasion for precaution!" They are much infested with a very nimble spider-shaped tick. There is but one species throughout India and Burma; unless *P. edulis*, Geoffroy, also should prove to range into Southern Tenasserim.

*P. NICOBARICUS*, Fitz.

*P. melanotus*, Blyth.

Resembles *P. medius*, but the skull differs in being shorter, wider across the maxillary and nasal bones, and in having all its processes and crests more strongly developed, and in the foramen ovate being divided by a process of bone, which is wanting in *P. medius*.

Inhabits the Nicobar and Andaman Islands.

#### CYNOPTERUS, F. Cuvier.

Muzzle much shorter and comparatively thicker than in *Pteropus*, but otherwise similar. Tail present, save in *C. ecaudatus*, from Sumatra. The shortness of the muzzle causes the suppression of the last molar.

Index finger with a claw.

Dentition, I.  $\frac{1}{4}$  or  $\frac{1}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{1}{2}$ ; M.  $\frac{4}{4}$ .

Sub-genus CYNOPTERUS. Incisors  $\frac{1}{2}$ .

C. (PTEROPUS) MARGINATUS, Geoff.

*Pteropus tittheachilus*, Tem.

*Pachysoma Diardii*, Is. Geoffr.

*P. Duvaucellii*, Is. Geoffr.

*P. brevicaudatum*, Is. Geoff.

*P. Lazoniense*, Peters.

*Pteropus pyricorus*, Hodgson.

*Cynopterus Horsfieldii*, Gray.

*Eleutherura marginata*, Gray.

Colour of fur very variable; dark-brown, reddish-brown, smut-brown, olive-brown; and during the breeding season the male is distinguished by a collar of stiff radiating reddish yellow hairs, the coarseness and colour of which appear to depend upon the presence of glands on the sides and on the inferior surface of the neck, similar to those on the shoulders of most species of *Pteropus*. Eyes white margined.

Length of male, head and body, 4·4 inches.

Inhabits the whole of India, Arakan, Pegu, Tenasserim, and the Andaman Islands.

Blyth says this is an "extraordinarily voracious feeder, and will devour more than its own weight at a meal, voiding its food, apparently but little changed, while slowly munching away."

This statement is corroborated by Dobson, who writes (Monograph Asiatic Chiroptera, p. 25): "To a specimen of this bat, obtained by me at Calcutta, uninjured, I gave a ripe banana (plantain), which, with the skin removed, weighed exactly two ounces. The animal immediately, as if famished with hunger, fell upon the fruit, seizing it between the thumbs and the index fingers, and took large mouthfuls out of it, opening the mouth to the fullest extent, with extreme voracity. In the space of three hours the whole fruit was consumed. Next morning the bat was killed, and found to weigh one ounce, half the weight of the food eaten in three hours! Indeed the animal when eating seemed to be a kind of living mill, the food passing from it almost as fast as devoured, and apparently unaltered, eating being performed alone for the sake of the pleasure of eating."

*C. BRACHYOTUS*, Müll.

*C. marginatus*, var. *Andamensis*, Dob.

Resembles *C. marginatus*, but the ears are much smaller, 0·7 long, 40·4 broad, against 0·95 and 0·6 in *C. marginatus*.

Inhabits the Andaman Islands.

*C. BRACHYSOMA*, Dobson.

Body short and thick. Fur slaty blue, with a greyish or silvery tinge, the tips of the hairs sooty-brown.

Length of adult female, 2·9; tail 0·25=3·15 inches.

Inhabits the Southern Andaman Island.

*C. SCHERZERI*, Fitz.

Resembles *C. marginatus*, but its ears are much smaller and not margined with white.

Length of adult female 3·70; tail 0·55=4·25 inches.

Inhabits Car-Nicobar Island. Found beneath the leaves of cocoa-nut palms.

#### CYNONYCTERIS, Peters.

Muzzle long and cylindrical, upper lip with a wide groove in front, with smooth not elevated margins. Index finger with a claw. Tail short.

Dentition, I.  $\frac{4}{4}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{4}{4}$ ; M.  $\frac{6}{6}$ .

*C. (PTEROPUS) AMPLEXICAUDATUS*, Geoff.

*Pteropus Leschenaultii*, Desmar.

*P. semimudus*, Kelaart.

Head long, triangular. Upper lip with a wide groove directly continuous with the emargination between the nostrils. The edges of the groove smooth, not thickened as in *Pteropus* and *Cynopterus*. Ears moderate, triangular, rounded at the tips. Fur short, from dark olive or smoky-brown to reddish or yellowish-brown. First lower premolar small, not half the size of next one.

Length of male, head and body, 4·3; tail 0·65 inches.

Inhabits Bengal, Southern India, Burma, etc.

#### EOXYCTERIS, Dobson.

Muzzle long and cylindrical, upper lip with a shallow vertical groove. Index finger without a claw. Tail short.

Dentition, I.  $\frac{4}{4}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{1}{1}$ ; M.  $\frac{6}{6}$ .

*E. SPELEA*, Dobson.

Head long, abruptly narrowed in front of the eyes. Tongue very long and pointed. Fur of a uniform dark colour. Tail about half an inch, half inclosed in the narrow interfemoral membrane as in *Cynonycteris*.

Length of male, head and body 4·5; tail 0·55 inches.

Inhabits the Farm Caves near Maulmain.

*MACROGLOSSUS*, F. Cuvier.

Muzzle cylindrical. Upper lip not grooved in front. Tongue very long and attenuated. Index fingers with a claw. Tail very short. Wing membrane from the base of the fourth toe.

Dentition, I.  $\frac{4}{4}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{1}{1}$ ; M.  $\frac{6}{6}$ .

*M. (PTEROPUS) MINIMUS*, Geoffroy.

*Pteropus rostratus*, Horsfield.

Muzzle cylindrical, very long and narrow. Tongue long, attenuated in its terminal third, and covered with numerous brush-like papillæ. Fur reddish-brown. Upper incisors in a triangular series, very small, scarcely raised above the level of the gum, each tooth separated from the next by an interval.

An adult female, head and body 2·3 inches.

Inhabits the Himalayan Mountains, Burma, etc.

*Eonycteris* and *Macroglossus* are social bats tenanting caves in frequently incredible numbers, from which they issue at dusk in a living stream, which has been not inappropriately likened to the smoke from a ship's funnel. Mr. Alfred Hough has noticed that at the Palghat cave above Kangoon, numbers of Kites and Hawks assemble near the caves at evening and seize and devour numbers of the bats when they first issue forth.

The 'guano' afforded by the species inhabiting the Farm Caves, and others in the Martaban district, is collected by Chinamen in Maulmain for use in their gardens.

### Sub-order *MICROCHIROPTERA*.

#### *Insectivorous bats.*

Crowns of the molar teeth acutely tubercular, marked by transverse furrows. Bony palate not continued laterally behind the first molar. Index finger not terminated by a claw. Stomach simple, or with the cardiac extremity more or less elongated. Carnivorous, feeding principally on insects, but the larger species devour small vertebrata as well, such as frogs, sparrows, and the smaller bats themselves. Distributed through the temperate and tropical regions of both hemispheres.

Without plates it is impossible to convey an adequate idea of the curious nasal appendages of many members of this division of Chiroptera, but full descriptions and plates are contained in Dr. Dobson's Monograph on the Asiatic Chiroptera, from which the present notes on the species of Bats inhabiting Burma have been mainly derived.

### Family *Rhinolophidæ*.

#### RHINOLOPHINÆ.

First toe with three, the remaining toes with two joints each.

*RHINOLOPHUS*, Geoffroy.

Nose-leaf very complicated, consisting of three distinct portions, anterior, central and posterior. The anterior horizontal portion is horseshoe-shaped, usually angularly emarginate in front, containing within its circumference the nasal orifices, and the central erect nasal process; the posterior nose-leaf is triangular, erect, and with cells on its anterior surface; the central process rises between and behind the nasal orifices,

is flattened anteriorly, and posteriorly sends backwards a vertical, laterally compressed process, which is either connected with the front surface of the posterior nose-leaf, or is free.

Dentition, I.  $\frac{2}{1}$ ; C.  $\frac{2}{1}$ ; P.M.  $\frac{3}{1}$ ; M.  $\frac{4}{1}$ .

Second lower premolar minute and placed exteriorly to the rest. First upper premolar minute, pointed, standing in the row with the rest or jammed in the outer angle between the closely approximated canine and second large premolar.

*R. LECTUS*, Tem.

*R. morio*, Gray.

*R. perniger*, Hodgson.

This is the largest of the genus, and remarkable for its peculiar and highly developed nasal appendages. Fur long and dense, usually of a jet black colour, with grey tips to the hairs, whence its specific name, but all shades to reddish-brown have been observed.

Adult male, head and body 3·6; tail 2·25 inches. Breadth of horseshoe 0·65. Females are a trifle smaller.

Ranges from Nipal to Sikkim and the Khasi Hills to Java, and doubtless is to be found in suitable spots in Burma, that is, on the higher mountain ranges. Capt. Hutton described this species as flying rather early in the evening and low, or between 20 and 30 feet from the ground, round buildings and large trees in search of beetles. It appears to be a solitary species found in pairs, and not congregating together as some of its congeners.

*R. AFFINIS*, Horsfield.

*R. Rouxi*, Tem.

Ears shorter than the head, acute. Horizontal horseshoe-shaped membrane moderate, not extending so far in front or laterally as to conceal the sides of the muzzle when viewed from above. Extreme tip of the tail projects from the interfemoral membrane.

Colour varies from greyish or reddish-brown to golden orange-brown.

Length 2·3; tail 0·90 inches.

Inhabits India and Burma.

*R. ANDAMANENSIS*, Dobson.

Resembles *R. affinis*, but the anterior horizontal horseshoe-shaped membrane is very broad, completely concealing the muzzle when viewed from above. Fur bright reddish-brown above and beneath.

Length of a male, head and body 2·5 inches.

Inhabits the Southern Andaman Island.

*R. PEARSONI*, Horsfield.

*R. larvatus*, A. Milne-Edwards.

*R. Yunnanensis*, Dobson.

Ears large, acutely pointed. Nose-leaf large. Horseshoe broad, projecting laterally and in front beyond the upper lip, so as to conceal the muzzle from above. Tail short, and wholly inclosed save the tip. Fur uniform dark-brown above and beneath, very long and dense.

Head and body 2·7; tail 0·9 inches.

Inhabits the Himalayas, Tibet and Yunnan.

*R. MINOR*, Horsfield.

*R. pusillus*, Tem.

Horizontal nose-leaf as in *R. affinis*. Lower lip with three vertical grooves. Fur light brown above, greyish-brown beneath.

Length—head and body 1·75; tail 0·85 inches.

Inhabits Yunnan and Burma.

*R. GAROENSIS*, Dobson.

Closely allied to *R. minor*, Horsf., from which the broad terminal portion of the

nose-leaf, not emarginate on the sides, distinguishes it. Wing membrane from the ankles; interfemoral membrane square, behind; the extreme tip of the tail free. It is the smallest species of the genus.

Length of head and body 1·5; tail 0·7 inches.

Inhabits the Garo Hills, Assam, and will probably be found in Arakan as well.

*R. CÆLOPHYLLUS*, Peters.

Ears large, with narrow acute tips projecting outwards. Chin marked with three small vertical grooves. Fur above brown, the hairs being white towards their base. Beneath, pale brownish white.

Length—head and body 2·0; tail 0·8 inches.

Inhabits Martaban and Upper Burma.

#### PHYLLORHININÆ.

Toes equal, of two phalanges each.

PHYLLORHINA, Bonaparte.

Dentition, I.  $\frac{2}{4}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{1}{1}$ ; M.  $\frac{3}{3}$ .

Many species are provided with a sac behind the nose-leaf, which can be everted at pleasure. The sides of the sac secrete a clammy substance, like the gular sac secretion of *Taphozous*, and its extremity supports a pencil of hairs of which the ends alone project, when the sac is inverted.

*P. ARMIGERA*, Hodgson.

*Hipposideros diadema*, Cantor.

*P. Swinhoei*, Peters.

This is the largest Asiatic leaf-nosed bat yet discovered, the fully expanded wings measuring nearly two feet across from tip to tip. Colour dark brown, usually paler towards the base of the hairs.

Adult male—head and body 4·2; tail 2·1 inches.

From Nipal to the Khasi Hills and China (Amoy), and doubtless found in suitable localities in Burma.

*P. LEPTOPHYLLA*, Dobson.

This species is distinguished from the last by its considerably smaller size, by the upper transverse nose-leaf being simple, and not lobed as in that species, and by the incised front edge of the horseshoe, which in *P. armigera* is invariably plain.

Length of an adult male—head and body 2·5; tail 1·65 inches.

Type from the Khasi Hills, ranging doubtless into Arakan.

*P. DIADEMA*, Geoffroy.

*Rhinolophus nobilis*, Horsf.

*R. griseus*, Meyer.

*Hipposideros lankadiva*, Kelaart.

Ears moderate, acutely pointed, concave beneath the tip. Last caudal vertebrae free. Fur above pale shining buff, for two-thirds the length of the hair, the rest chocolate or reddish-brown, with ashy extremities. Beneath light greyish or buffy brown throughout.

Length—head and body 3·4; tail 2·3 inches.

Inhabits India and Burma.

*P. MASONI*, Dobson.

The concave front surface of the terminal nose-leaf is divided into two cells only, by a median vertical ridge. From the under surface of the symphysis of the mandible, a small conical bony process projects downwards, about equal to the lower canine tooth in vertical extent, and covered by skin. In other respects resembles *P. diadema*, of which it is probably a race, if not a mere individual variety.

Length—head and body 3·65; tail 1·65 inches.

Inhabits Martaban Province.

*P. SPECIOSUS*, Schneider.

*R. Dukhuanensis*, Sykes.

*Hipposideros apiculatus*, Gray.

*H. penicillatus*, Gray.

This species resembles *P. larvata*, but is distinguished by the absence of the incision in the front free edge of the horseshoe, and by the last caudal vertebrae being completely free from the interfemoral membrane.

Length—head and body of a male 2·4; tail 0·85 inches.

Inhabits Pegu and Upper Burma.

*P. LARVATA*, Horsfield.

*R. insignis*, Tem.

*Hipposideros vulgaris*, Blyth.

Variable as to colour and development of the facial appendages. Colour golden yellow for the basal three-fourths of the hair, the remainder dark ferruginous brown. Sometimes bluish-black, paler towards the base of the hair.

Length of male, head and body 2·8; tail 1·4 inches.

Inhabits Bengal, Arakan and Burma.

*P. NICOBARENSIS*, Dobson.

Ears large, acute. No frontal sac behind the nose-leaf. The last caudal joint alone free. Fur above, light-brown at the base, then greyish with light-brown tips. Beneath pale brownish.

Head and body 3·0; tail 1·1 inches.

Inhabits the Nicobars.

*P. GALERITA*, Cantor.

*P. Labuanensis*, Tomes.

*P. longicauda*, Peters.

*P. brachyota*, Dobson.

Ears comparatively small, as broad as long. Frontal pore small, indistinct, not larger than in the females of *P. larvata*. Fur above light brown at the base, the terminal third of the hairs dark reddish-brown. Beneath similar, but paler. The fur on the shoulders and along the spine darker. Wings and interfemoral membranes very dark brown. The second upper premolar is separated from the canine by a wider interval than usual in this genus; in the midst of this space, but rather to the outside, the small, scarcely distinguishable first premolar is placed.

Length of head and body 2·0; tail 1·6 inches.

Inhabits Java, Pinang, India, and doubtless Burma.

*P. BICOLOR*, Temm.

*Phyllorhina atricola*, Peters.

Ears as long the head. Fur above, reddish-chestnut, the basal three-fourths of the hair reddish-white. Beneath paler.

Head and body 1·9; tail 1·2=3·1 inches.

Inhabits the Nicobars, the Himalayas, and Java.

The next species only differs in having larger ears, and is regarded therefore as a subspecies only by Dobson.

*P. (HIPPOSIDEROS) FULVA*, Gray.

*H. murinus*, Gray.

*Rhinolophus fulgens*, Elliot.

*H. atratus*, Kelaart.

*P. aurita*, Tomes.

*H. cineraceus*, Blyth.

Ears large, longer than the head. Fur above white for its basal three-fourths, the rest reddish-brown or black. Beneath white or pale yellowish white, the white colour both above and below sometimes replaced by brilliant golden yellow, with the tips above rich reddish-chestnut, the brilliancy of the fur of some individuals being

probably unequalled by any other mammal. Dr. Dobson once thought that this seasonal golden yellow fur in the Chiroptera was restricted to the pregnant females (P.Z.S. 1873, p. 250), but he subsequently thus modifies his former opinion, "However, during the second Yunnan Expedition, Dr. Anderson obtained several males of this species in the same cave, all of which possessed this golden yellow colour, while males and females, obtained at the same time in adjoining caves, were of the common black and white kind. These very differently coloured animals differed, however, in no other respect, agreeing in structure in all respects and in measurements. The conditions under which this remarkable difference in colour occurs are therefore still unexplained; but the golden-yellow colour may be developed equally in males and females when the sexes come together, which may not occur at the same season for all" (Mon. Asiat. Chir. p. 71).

Length of adult male—head and body 1·9; tail 1·1 inches.

In Nicobar specimens the tail is 1·2.

The whole of India and Burma, ranging to Amoy.

Dobson remarks, "As *P. fulva* can be distinguished from *P. bicolor* by its larger ears only, I am unable to consider it more than a subspecies."

### Family Nycteridæ.

Bats with distinct nose-leafs; large united ears with well-developed tragi. Upper incisors absent, or very small, in the centre of the space between the canines. Molars well developed with acute W-formed cusps.

Dentition, I.  $\frac{1}{4}$  or  $\frac{1}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{4}{4}$  or  $\frac{2}{4}$ ; M.  $\frac{6}{6}$ .

MEGADERMINE. Tail very short.

MEGADERMA, Geoffroy.

Nostrils at the bottom of a cavity at the end of the muzzle, concealed by the base of an erect cutaneous process. Tail short, in the base of the large interfemoral membrane.

Dentition, I.  $\frac{1}{4}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{4}{4}$  or  $\frac{2}{4}$ ; M.  $\frac{6}{6}$ .

M. SPASMA, L.

*M. trifolium*, Geoffr.

*M. Philippinensis*, Waterhouse.

Colour pale slaty blue, paler below.

Length of head and body, 3·4 inches.

Inhabits Tenasserim and the Malay Peninsula, etc.

This species closely resembles *M. lyra*, Geoff., which inhabits the whole of India, differing from it only in tritling points. Whether both species range into Arakan and Pegu is not known.

In a paper "On the Sanguivorous and Predaceous Habits of the Bats of the Genus *Megaderma*" (J.A.S.B. vol. xi.) the following interesting remarks are made by Mr. Blyth on the closely allied *M. lyra*, which apply to habits no doubt possessed by all its congeners. "Chancing one evening to observe a rather large bat enter an outhouse, from which there was no other egress than by the doorway, I was fortunate in being able to procure a light, and thus to proceed to the capture of the animal. Upon finding itself pursued, it took three or four turns round the apartment, when down dropped what at the moment I supposed to be its young, and which I deposited in my handkerchief. After a somewhat tedious chase, I then secured the object of my pursuit, which proved to be a fine female of *Megaderma lyra*. I then looked to the other bat, which I had picked up, and to my considerable surprise found it to be a small *Vesperugo*, nearly allied to the 'Pipistrelle' of Europe, which is exceedingly abundant not only here, but apparently throughout India.<sup>1</sup> The individual now referred to was feeble from loss of blood, which it was evident the *Megaderma* had been

<sup>1</sup> *Vesperugo abramus*, Tem.



sucking from a large and still bleeding wound under and behind the ear; and the very obviously suctorial form of the mouth of the Vampire was of itself sufficient to hint the strong probability of such being the case. During the very short time that elapsed before I entered the outhouse, it did not appear that the depredator had once alighted, and I am satisfied that it sucked the vital fluid from its victim as it flew, having probably seized it on the wing, and that it was seeking a quiet nook where it might devour the body at leisure. I kept both animals separate till next morning, when procuring a convenient cage, I first put in the *Megaderma*, and after observing it for some time, I placed the other Bat with it. No sooner was the latter perceived, than the other fastened upon it, with the ferocity of a tiger, again seizing it behind the ear, and made several efforts to fly off with it, but finding it must needs stay within the precincts of the cage, it soon hung by the hind legs to one side of its prison, and after sucking its victim, till no more blood was left, commenced devouring it, and soon left nothing but the head and some portions of the limbs."

Both frogs and sparrows would also seem to form the prey of the larger bats, to judge by the remains of nocturnal feasts in the form of bones and feathers, which are sometimes seen in the verandahs of houses tenanted by them.

### Family Vespertilionidæ.

Bats with simple nostrils, unprovided with leaflets (save a rudimentary appendage in *Nyctophilus*), with moderately developed generally separate ears. Eyes minute.

#### PLECOTUS, Geoffroy.

Ears united above the forehead, very large. Nostrils opening on the upper surface, at the extremity of the muzzle, in front of semilunar naked depressions. Tail almost wholly inclosed within the interfemoral membrane. Post-calcaneal lobe distinct.

Dentition, I.  $\frac{4}{4}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{4}{4}$ ; M.  $\frac{6}{6}$ .

#### P. HOMOCHEIROS, Hodgson.

Fur basally both above and below dark; on the upper surface light shining brown; beneath, pale ashy or dirty white; occasionally there is a reddish tinge over the back, and specimens from dry and desert regions are paler than those captured in moister countries. This species is, in Dobson's opinion, only a subspecies or race of *P. auritus*, L., distinguished by the greater length of the ears and comparative shortness of the thumbs.

Length of head and body, 1·7; tail, 1·7 inches.

Inhabits the Himalaya and Khasi Hills, not improbably ranging into Arakan.

#### SYNOTUS, Keyserling and Blasius.

Ears conjoined at the bases of their inner margins, which meet on the forehead slightly in front of the eyes; the outer margin is also carried forwards, in front of the eyes, terminating on the face above the upper lip, so that the eye is contained within the external ear.

Dentition, I.  $\frac{4}{4}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{4}{4}$ ; M.  $\frac{6}{6}$ .

#### S. DARJELINENSIS, Dobson.

The ears laid forward, extend nearly one-tenth of an inch beyond the end of the muzzle, as in the European 'Barbastelle,' but the outer margin has no projecting lobe, at the junction of its upper and middle third, and is uninterrupted by any abrupt projection from the tip to its termination above the mouth. The tip rounded off, not truncated.

Length of adult female—head and body 2·0; tail 1·8 inches.

Inhabits the Himalayas, Sikkim, the Khasi Hills and probably ranges into Arakan.

#### VESPERGO, Keyserling and Blasius.

Ears separate, generally much shorter than the head, broad and triangular, the outer margin extending forwards beyond the base of the tragus, the internal basal

lobe rounded. Nostrils opening sublaterally, by simple crescentic apertures on the front surface of the naked extremity of the muzzle. A small cutaneous lobe on the calcaneum usually present behind.

<sup>1</sup> Dentition, I.  $\frac{4}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{1}{1}$  or  $\frac{2}{1}$ ; M.  $\frac{0}{0}$ .

Outer upper incisors unicuspidate and shorter than the rest, often minute (rarely absent).

Sub-genus *Vesperugo*.

I.  $\frac{4}{2}$ ; P.M.  $\frac{1}{1}$ . Post-calcaneal lobe well developed; thumbs and soles of feet simple.

V. NOCTULA, Schr.

*Vespertilio lasiopterus*, Schreb.

*V. magnus*, Berkenhout.

*V. alticolaus*, White.

*V. scrocinus*, Geoffr.

*V. proterus*, Kuhl.

*V. labiata*, Hodgson.

*V. Macuanus*, Peters.

Nostrils wide apart, with a slightly concave interspace. Ears as broad as long, tips very broadly rounded. Feet thick. Thumb short, with a blunt claw. Wing membrane attached to the ankles. Post-calcaneal lobe large, semicircular, placed on the calcaneum, at the same distance from the tibia as the breadth of the foot. The last rudimentary caudal vertebra free. First upper premolar very small. Last upper molar triangular in cross section. Length of head and body, 3.0; tail 2.0 inches.

Ranges from the Himalayas to the Malayan Peninsula, and temperate parts of Europe, Asia, and Africa.

V. LEISLERI, Kuhl.

Very like *V. noctula*, "but while the outer incisor on each side in *V. noctula* is but half the transverse diameter, at its base, of the inner incisor, in this species it is equal to it. The lower incisors also stand in the direction of the jaws, and are not crowded."

Length of head and body of adult male 2.3; tail 1.65 inches.

Europe and temperate regions of Asia from the Azores to the Himalayas.

V. ABRAMUS, Tem.

*V. imbricatus*, Tem. (non Horsfield).

*Scotophilus Javanicus*, Gray.

*S. Coromandra*, Gray.

*Vespertilio Coromandelicus*, Blyth.

*Vesperugo Blythii*, Wagner.

*V. imbricatus* (Hutton), Peters.

Colour above dark brown, the hair tipped with light yellowish-brown. On the head, face and neck wholly yellowish-brown. Beneath sooty-brown, the extremities of the hairs much paler than upon the upper surface.

Length—head and body 1.75; tail 1.4 inches.

Inhabits India and Burma, and is the commonest bat in Southern Asia.

V. MAURUS, Blasius.

*V. mordax*, Peters.

*V. pulveratus*, Peters.

*Pipistrillus Austenianus*, Dobson.

Fur long and dense, uniformly sooty-brown, or deep black throughout, with ashy tips. Cutaneous system black. The nose, ears and naked glandular prominences of the upper lip are intensely black.

Length of head and body 1.9; tail 1.6 inches.

[<sup>1</sup> *Scotozous*, *Dobson*, has only 2 upper incisors.]

Specimens from Java are a trifle larger, and from China a trifle smaller.

Distributed over Europe, the Canary Islands, China, the Khasi Hills, and no doubt Burma also.

V. AFFINIS, Dobson.

Head flat; glands of the upper lip so developed as to cause a deep depression between them on the face, behind the nostrils. The tail is long, of nine vertebrae, the last free. Colour above chocolate-brown, lighter on the head and neck. Beneath dark brown, with paler or ashy tips to the hair. On the pubes and along the thighs dirty white or very pale buff.

Length of head and body 1.9; tail 1.65 inches.

Inhabits Bhamo, Yunnan.

Sub-genus *Vesperus*.

Incisors  $\frac{3}{4}$ ; P.M.  $\frac{2}{4}$ . Post-calcaneal lobe narrow. Wings from the base of the toes. Thumbs and soles of the feet simple.

V. PACHYOTIS, Dobson.

"This species is readily distinguished by the peculiar thickness of the lower half of the outer side of the ear-conch, which appears, as it were, excavated out of the thick integument of the neck." Muzzle very broad and short; with well-developed glandular prominences. Immediately behind them, a furrow extends from the anterior corner of one eye to that of the other, beyond which, the fur of the head does not pass.

Fur brown, dark above, paler below.

Adult male, head and body 2.2; tail 1.6 inches.

Type from the Khasi Hills. This species probably ranges into Arakan.

Dobson remarks, "In the form of the ears and muzzle especially, and generally in the whole conformation, this species appears to belong to the sub-genus *Vesperugo*, but the absence of the first minute upper premolar relegates it to *Vesperus*. Nothing could illustrate better the artificial character of these subgenera, which, however, are convenient in determining the species" (Mon. Asiat. Chir. p. 105).

V. ANDERSONI, Dobson.

Head broad and flat. Tail of eight vertebrae, the last alone free. Fur above dark brown, with greyish tips. Beneath light greyish-brown for the basal two-thirds, the remainder of the hair ashy.

Length—head and body 2.6; tail 1.9 inches.

Inhabits Momein, Yunnan.

Sub-genus *Tylonycteris*.

Incisors  $\frac{3}{4}$ ; P.M.  $\frac{2}{4}$ . Base of the thumbs and soles of the feet with broad fleshy pads. Crown of the head remarkably flattened.

V. PACHYPUS, Tem.

*Scotophilus fulvidus*, Blyth.

*T. Meyeri*, Peters.

Tail projecting by the extreme tip only. Fur dense, above bright reddish-brown, paler beneath.

Length—head and body 1.75; tail 1.3 inches.

Inhabits India, The Andaman Islands, and Tenasserim.

Sub-genus *Alobus*.

Incisors  $\frac{3}{4}$ ; P.M.  $\frac{3}{4}$ . No postcalcaneal lobe.

V. ANNECTANS, Dobson.

Extreme tip of tail free. Colour brown, darker above, and the tips of the upper surface paler, of the lower surface reddish. The hair forms a thick fringe along the margin of the upper lip.

Length of head and body 2.0; tail 1.6 inches.

Inhabits the Naga Hills, and probably ranges into Arakan. This species unites the external appearance of a *Vespertilio* with the dentition of *Vesperugo*.

## SCOTOPIHILUS, Leach.

Ears longer than broad, generally considerably shorter than the head, with rounded tips; the outer margin terminating near the angle of the mouth. Nostrils close together, opening by simple lunate apertures in front, or sublaterally, their inner margins projecting. Fur short, and nearly confined to the body; wing and interfemoral membranes very thick and leathery.

Dentition, I.  $\frac{2}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{4}{4}$ ; M.  $\frac{6}{6}$ .

An additional external incisor on each side above in the opening. Upper incisors long, unicuspidate, acute, close to the canines. Upper premolar large, close to the canine. First lower premolar small, crushed in between the canine and second premolar.

S. TEMMINCKII, Horsfield.

*S. Kohlii*, Leach.

*Vespertilio Belangeri*, Is. Geoffr.

*V. noctulinus*, Is. Geoffr.

*V. castaneus*, Gray.

*Nyctiejus luteus*, Blyth.

*N. flavcolus*, Blyth.

Colour variable; dark olive-brown above and reddish or yellowish-white beneath. Sometimes deep chestnut throughout or below yellow.

Length—head and body of male 3.1; tail 2.1 inches.

Inhabits India and Burma.

S. ORNATUS, Blyth.

Fur light isabelline-brown, remarkably pied with white spots and a longitudinal patch of white on the crown, and a white band, two-thirds the length of the spine. A white spot at the base of the ears and two white patches behind the head of the humerus. A white band below the neck. The position of the white patches is generally very constant, but their size varies, being greatest apparently in individuals of a pale rusty-red colour, and these I have always found to be males. The females have much darker fur, and the white spots and bands are of less size and are occasionally altogether absent.

Length of head and body 3.1; tail 2.5 inches.

Inhabits Sikkim, the Kakhyen Hills, and Yunnan.

Dobson remarks that this bat is the nearest representative of the American genus *Atalapha* (= *Lasiurus*).

## VESPERTILIO, Keyserling et Blasius.

Muzzle long; small glandular prominences between the nostrils and eyes, which scarcely increase the breadth of the face. Nostrils opening sublaterally by simple crescentic apertures. Ears separated, oval, longer than broad. Tail usually less than the length of the head and body. Postscapular lobe absent or very small. Face hairy.

Dentition, I.  $\frac{1}{1}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{6}{6}$ ; M.  $\frac{6}{6}$ .

Upper incisors nearly equal; the inner incisor on each side generally has a distinct second cusp, placed posteriorly and externally. First and second upper premolars very small; the second often minute and pressed inwards; the last upper molar rather less than half the antepenultimate.

Sub-genus *Leuconoe*.

Feet very large. Interfemoral membrane forming a very acute angle in the centre of its free margin behind; one or two last caudal vertebræ project beyond the membrane.

V. HASSELTII, Tem.

Fur very short, above and beneath; the muzzle in front of the eyes almost naked. Fur scarcely extends to the wing membranes, except at their origin; on the interfemoral membrane, both above and below, it extends as far as a line drawn

between the knee-joints. The fur on the under side of the wings extends to a line drawn from the elbow joint to the commencement of the distal third of the femur. Fur above basally dark, with brown tips; beneath, dark brown or black, with white ends. The second premolar in both jaws is extremely small, and with difficulty seen even with a lens. It is placed in the angle between the first and third premolars, and in vertical height does not equal the cingulum of either tooth.

Length of adult female—head and body 2.1; tail 1.8 inches.

Inhabits Java, the Malayan Peninsula, Siam and probably Tenasserim.

In no species of *Vespertilio* is the second lower premolar quite internal, and placed in the angle between the adjoining teeth, without filling it.

Sub-genus *Vespertilio*.

Feet moderate. Interfemoral membrane forming an obtuse angle in the centre of its free margin behind. Tail wholly contained within the membrane, or the extreme tip alone projecting.

V. *MURICOLA*, Hodgson.

*Kerivoula tridactyloides*, Gray.

*V. caliginosus*, Temes.

*V. ater*, Bernstein.

*V. (Pternopterus) lobipes*, Peters.

*V. blanfordi*, Dobson.

*V. moupinensis*, Alph.

Second upper premolar slightly internal to the tooth row, and so small as to be barely perceptible without the aid of a lens. Colour above black, with yellowish brown tips. Beneath black, with ashy tips.

Length—head and body 1.6; tail 1.55 inches.

Inhabits the Himalayas, Arakan, and the Malay Peninsula.

V. *MONTIVAGES*, Dobson.

Muzzle obtuse. Ears narrow, with rounded tips. Feet very small. Tail wholly inclosed. Fur above, dark brown, the extreme tips paler and shining. Beneath, much darker, almost black from the basal three-fourths, the terminal fourth of the hairs ashy. The eyes buried in hair, the tip of the nose alone naked. On each side of the muzzle, two or three glandular elevations may be discerned through the hairs. The ears naked anteriorly, their bases clothed posteriorly. Inner incisors longest, with a small acutely pointed talon near their extremities on the outer side. In the lower jaw the second premolar is small, but distinctly visible in the teeth row. In the upper jaw the second premolar is very minute, and placed interiorly, and barely visible with a lens.

Head and body 1.8; tail 1.6=3.4 inches.

Inhabits Hotha in Yunnan.

V. *FORMOSUS*, Hodgson.

*Kerivoula pallida*, Blyth.

*V. auratus*, Dobson.

Wing-membranes very broad, attached to the base of the toes, and remarkably variegated with orange and rich brown-black. The portions of dark-coloured membrane are triangular in form, and occupy the interspaces between the second, third, and fourth fingers, and the space between the fourth finger and a line drawn from the carpus to the ankle. All the remaining portions of the membrane, including the ears and interfemoral apron, are orange. The second upper premolar very minute, and difficult to discover even with a lens.

Length of adult female—head and body 2.4; tail 1.9 inches.

Ranges from Nipal to the Khasi Hills and Shanghai.

*KERIVOUA*, Gray.

Dentition, I.  $\frac{1}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{2}{2}$ ; M.  $\frac{2}{2}$ .

Second upper premolar smaller than the third but not so minute as in *Vespertilio*.

Second lower premolar equal to or slightly larger than the first and nearly or quite equal to the third. Tail long, wholly contained within the interfemoral membrane.

*K. picta*, Pallas.

Fur above deep orange, beneath paler. The wing-membrane between the humerus and the posterior limb, the free margin of the membrane between the foot and the fourth finger, along the posterior side of the forearm, and on both sides of each finger, deep orange; the remainder deep black, with scattered orange dots.

Length—head and body 1.55; tail 1.6 inches.

Inhabits India and Burma.

Dobson makes the following interesting remarks on the colouration of this and some allied bats. "The very peculiar markings of the membranes of this bat, of *Vesperugo formosus* and of *V. Hehritschii*, Gray, from S.W. Africa, are on the same plan, and appear to be the result of 'protective mimicry,' the colours being arranged so as to resemble the leaves or the fruits of the trees in which these bats take up their abode. Of one of the two first-named species probably, Mr. Swinhoe remarks, 'A species of *Kiroulia*, allied to *K. picta* and *K. formosa*, was brought to me by a native. The body of this bat was of an orange-brown, but the wings were painted with orange-yellow and black. It was caught suspended, head downwards, on a cluster of the round fruit of the Longan tree (*Nephelium longanum*). Now this tree is an evergreen, and all the year through some portion of its foliage is undergoing decay, the particular leaves being, in such a stage, partially orange and black. This bat can therefore at all seasons suspend itself from the branches, and elude its enemies by its resemblance to the leaf of the tree.'"—Mon. Chiropt. p. 147.

HARPIOCEPHALUS, Gray.

Muzzle elongated, conical; nostrils prominent, tubular, produced beyond the upper lip, and opening laterally or sublaterally. Ears thin, generally covered with glandular papillæ. Thumb very large, with a large strongly curved claw. Interfemoral apron very hairy.

Dentition, I.  $\frac{4}{1}$ ; C.  $\frac{2}{1}$ ; P.M.  $\frac{4}{1}$ ; M.  $\frac{6}{1}$ .

Upper incisors on each side parallel, stout, and blunt; posterior upper molar small, or consisting of a thin transverse lamina of bone, and sometimes absent in the adult.

H. HARPIA, Tem.

*Noctulina lasypura*, Hodg.

*Lasiurus Pearsonii*, Horsfield.

Muzzle rather short; end of nose projecting considerably beyond the lip, and composed of the diverging tubular nostrils. Teeth thick and strong, with blunt cusps. Posterior or third molar small, deciduous, and generally absent in adults.

Length of adult female—head and body 2.5; tail 2.0 inches.

Inhabits Sikkim the Khasi Hills, Java and doubtless suitable spots in Burma.

These bats, to judge by their teeth, prey chiefly on the harder and more robust *Coloptera*.

MINIOTTERUS, Bonaparte.

Dentition, I.  $\frac{4}{1}$ ; C.  $\frac{2}{1}$ ; P.M.  $\frac{4}{1}$ ; M.  $\frac{6}{1}$ .

The first phalanx of the second or longest finger very short. Tail as long as the head and body, and wholly inclosed in the interfemoral membrane. Upper incisors in pairs on each side, separated from the canines.

M. SCHREIBERSII, Natterer.

The four lower incisors in front equal and trilobed, those next the canines larger, with rounded summits. Margin of the eye prominent; a deep horizontal groove on the side of the face parallel to the mouth, below the eye. Colour variable. The basal half of the hairs always dark-greyish black or brown; the extremities of the hairs varying from light grey or reddish-grey to dark-reddish brown or black.

Length—head and body 2.25; tail 2.3 inches.

Inhabits Burma, also the Philippines, Timor and Australia.

M. SCHREIBERSII, Natterer.

Var. *ruficeps*, Dobson.

*M. australis*, Dobson (non Temes).

Dr. Dobson thus describes this species: "This form inhabits probably the same countries with *M. Schreibersii*, which it resembles in all respects except in size and in the distribution of the fur. The head and forearm are conspicuously shorter, and these characters are not founded on observation of immature specimens, but on measurements taken from perfectly adult individuals obtained in large numbers at different times from the same and different localities. In all these the length of the head never exceeded 0.6, and that of the forearm 1.6. On the upper surface the fur extends upon the interfemoral membrane as far as the end of the third caudal vertebra. Fur intensely black throughout, the extreme tips of the hair sometimes greyish."

Inhabits Burma and the Nicobars.

### Family Emballonuridæ.

Bats with nostrils at the extremity of the muzzle, simple or valvular, without distinct cutaneous appendages. Ears large, often united. The first phalanx of the middle finger is folded in repose, forwards on the upper surface of the metacarpal bone.

TAPHOZOUS, Geoffroy.

Dentition, I.  $\frac{7}{1}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{4}{4}$ ; M.  $\frac{5}{5}$ .

Upper incisors weak and deciduous. The last molar consists of a narrow transverse lamina.

Tail perforates the interfemoral membrane, and appears on its upper surface.

*Sub-genus Taphozous.*

*a. Radio-metacarpal pouch distinct. Lower lip scarcely grooved.*

T. MELANOPOGON, Tem.

*T. Philippinensis*, Waterhouse.

No gular sac. The openings of small pores appear along a line occupying the position of the gular sac in other species.

Colour dark brown above, the hairs white towards the base, and tipped with grey. Beneath paler.

Length of male—head and body 3.1; tail 1.0 inches.

Inhabits Burma and the Philippines.

T. THEOBALDI, Dobson.

No gular sac in either sex. This species is distinguished from *T. melanopogon* by its larger ears, and by the absence of fur on the upper surface of the wing and interfemoral membranes.

Inhabits Tenasserim.

T. LONGIMANUS, Hardwicke.

*T. fulvidus*, Blyth.

*T. brevicaudus*, Blyth.

*T. Cantori*, Blyth.

A gular sac in the male. In the female by a rudimentary fold of naked skin. Colour dark brown to black, the bases of the hairs white.

Length—head and body 3.1; tail 1.0 inches.

Inhabits India and Burma.

*Sub-genus Taphonycteris.*

*b. No radio-metacarpal pouch. Lower lip deeply grooved.*

T. SACCOLAIMUS, Tem.

Gular sac well developed in both sexes. Colour above black, the basal portion of the hair white. Beneath dark brown.

Length—head and body 3.5; tail 1.3 inches.

Inhabits India and Tenasserim.

*RHINOPOMA*, Geoffroy.

Nostrils valvular in the anterior margin of a rudimentary nose-leaf. Ears united across the forehead, which is marked by a deep concavity, as in *Taphozous*, between the eyes. Index fingers with two phalanges. Tail slender, produced considerably beyond the truncated interfemoral apron.

Dentition, I.  $\frac{2}{4}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{2}{4}$ ; M.  $\frac{6}{6}$ .

Upper incisors rudimentary, suspended in the small premaxillary bones, which meet in the centre, and are connected laterally by slender processes, as in *Emballonura*, with the maxillary bones.

*R. MICROPHYLLUM*, Geoffroy.

var. *R. HARDWICKII*, Gray.

Extremity of the muzzle thick, obtuse, obliquely truncated, and projecting considerably beyond the lower lip. Nasal apertures composed of valvular slits. Face almost naked.

Length of adult—head and body 3.0; tail 2.35 inches.

How extremely gregarious this bat is, may be inferred from the fact, that a man, to whom I had expressed a wish for bats, produced one morning a sack containing two hundred and seventy individuals, which had been captured the previous night in an old tomb near Bhera, on the Jhilum, below Pind Dadan Khan. Great was the worthy countryman's surprise when, with the exception of a few specimens placed in bottles, the rest were thrown away. Having been paid for their capture, he evidently supposed that I should at once order them to be cooked for my breakfast; and no wonder, for, in the eyes of an uneducated Mahomedan, a man who will eat the abhorred flesh of the pig, cannot have any scruples of delicacy regarding any other meats. These bats I remember were enormously fat in the pubic region, as observed by Dobson in the case of this species and *Taphozous nudiventris* only.

This species is merely the Asiatic race (or subspecies), in Dobson's opinion, of the African *R. microphyllum*, and is more nearly related to *Taphozous*, than to *Megaderma*, near which it has been usually classed, and Dobson remarks, "*Rhinopoma* is, in my opinion, closely related to *Taphozous*. Its connexion with that genus is shown in the peculiar frontal depression, in the projecting muzzle and valvular nostrils, in the weak and deciduous upper incisors, in the form and folding of the wing; in the production of the tail beyond the interfemoral membranes, and even in the microscopical structure of the hair. Farther, the species of these genera show remarkable similarity in their habits, and in them, an enormous deposit of fat is heaped up, about the root of the tail, before the hibernating season. Similar deposits of fat have not been observed by me in any other genera of Chiroptera."

*CHEIROMELES*, Horsfield.

Ears separate. Muzzle projects beyond the lower jaw. Premaxillary bones well developed, conjoined, and supporting two strong incisors. Tail thick and long, projecting more than half its length beyond the short interfemoral apron.

Dentition, I.  $\frac{2}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{2}{4}$ ; M.  $\frac{3}{3}$ .

*C. TORQUATUS*, Horsf.

*Dysops cheiropus*, Tem.

*C. caudatus*, Tem.

An enormous gular sac extends round half the neck, the interior margin of its mouth on a level with the front of the sternum. Into this sac the oily secretion between the internal origins of the pectoral muscles is discharged, in males by a series of small pores, collected in two circular slightly elevated patches, and in females by a single large orifice.



A deep axillary pouch is formed in both sexes, by an extension of the thick integument covering the breast and sides of the body, to the under surface of the humerus, and longitudinally to the femur. In the anterior part of this pouch, on the side of the body, behind the axilla, the mamma is placed.

Skin thick and almost naked, but a collar of short hairs round the neck, and a few short hairs upon the under part of the body and interfemoral apron.

Length of adult male—head and body 5·3; tail 2·6 inches.

Inhabits Borneo, Java, Sumatra and the Malayan Peninsula, and possibly ranges into Tenasserim.

This bat is perhaps one of the most repulsive to the casual observer known, from its naked skin and the offensive odour which emanates from the glands in the gular sac. Dr. S. Müller records that this odour was so offensive as to induce headache and nausea in the artist, M. Van Oort, who could with difficulty therefore complete his drawing of the animal. It would be interesting to know more of the habits of this remarkable creature, which from its wide distribution cannot be considered as rare.

There is no reasonable doubt that a vast number of species of bats still remain unrecorded from Pegu and Tenasserim. The above list has been compiled from Dobson's Monograph already quoted, some species being included which have not been captured within Burmese limits, though from their ascertained range, *e.g.* from Java to the Khasi Hills, no doubt occurring there in suitable localities. But many species, hitherto only recorded from the Malayan region, or Java, Borneo and Sumatra, no doubt extend their range into Tenasserim at least, and will reward some future collector who may specially devote himself to these interesting but not easily procured animals.

## Order INSECTIVORA.

Plantigrade lissencephalic mammals, having sharp or complex (insectivorous) molars, and small canines.

### Family **Talpidae**.

Fore feet large; fossorial with large claws. External ears none. Eyes very minute. Tail short or none. Habits fossorial.

**TALPA**, *Linnaeus*.

Dentition, I.  $\frac{6}{1-6}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{6_{or\ 8}}{4}$ ; M.  $\frac{4}{4}$ .

**TALPA LEUCURA**, Blyth.

Nearly allied to *T. microura*, but differing in the greater development of the tail, and in possessing only *two* upper premolars (instead of three as in *T. microura* and *T. europæa*). In this, as in *T. microura*, there is no perforation of the integument over the eye.

Ranges from Silhet to the valley of the Sittoung (Schwagheen).

### Family **Soricidae**.

The Shrews comprise a number of small animals, which are popularly confounded with rats and mice, though the one are insectivores, the others rodents. The two middle incisors above are large and hooked, the lower ones are slanting and lengthened. The snout is lengthened, pointed, and very mobile and sensitive. Some species possess a powerful musky odour, which others want. Dr. Anderson's study of these animals has led him to judge "those adult in which the *basi-occipital* and *basi-sphenoid* bones have been united. This is the last suture to disappear, and its obliteration in shrews is the only reliable test of full maturity."

For a full account of the various species which occur in Assam, some of which doubtless range into Burma, reference may be made to a paper by Dr. James Anderson in the Journ. As. Soc. Beng. 1877, Part II. p. 261.

a. *Teeth white.*ANUSOREN, *A. Milne-Edwards.*Dentition,  $\frac{4}{2}$ ;  $\frac{2}{2}$ ;  $\frac{2+2}{2+2}$ ; 26.

The intermaxillary suture between the first and second lateral teeth.

A. ASSAMENSIS, *Anderson.*

The type was from Assam, and the species may perhaps range into hills of Arakan.

CHIMARROGALE, *Anderson.*

Feet scaly, ciliated, toes not webbed. Tail long, scaly, quadrangular, thickly clad with coarse adpressed hairs. Snout elongate. Ears almost hidden, valvular. Habits aquatic.

Dentition,  $\frac{2+1}{2} + \frac{2}{2} + \frac{2+2}{2+2} = 28$ .C. HIMALAYICUS, *Gray.*

Upper incisors furnished with a talon. Fur velvety, above dark grey, deeply washed with dark fuliginous brown. Below silvery grey, washed with rusty on the throat and middle of the belly. Eye small, almost hidden. Nostrils with an anterior cartilaginous valve.

Head and body 3.83; tail 3.00 inches.

Ponsee at 3500, Darjiling, Assam.

CROCIDURA, *Wagner.*Dentition  $\frac{6}{2} + \frac{2}{2} + \frac{3}{3} = 28$ .C. FULIGINOSA, *Blyth.*

Fur dense, velvety. Fuliginous brown, with inconspicuous hoary tips, and basally slaty. The scattered long hairs on the tail fine. Soles bare to the heel. Inhabits Tenasserim.

A nearly allied species, *C. Kingiana*, *Anderson*, inhabits Sikkim; but this latter species is "distinguished from it, among other details in its structure, by its narrower feet, although it is a larger form." *C. Kingiana* measures—head and body 3.2; tail 2.42; total 5.62 inches.

PACHYURA.

Dentition,  $\frac{6}{2} + \frac{2}{2} + \frac{1+0}{1+0} = 30$ .P. INDICA, *Gcoff.*

The musk rat. Kywet-sök.

Uniform pale grey, the naked parts flesh-coloured.

Head and body 7.50; tail 3.75=11.25 inches.

This is the common 'musk rat' of Bengal and Burma, and possesses a powerful musky odour. It haunts kitchens and larders in search of victuals, and enters houses in pursuit of cockroaches and spiders, and from the repulsive odour it diffuses and imparts to objects it has passed over, is one of the greatest animal pests in the East. The idea of its musky odour penetrating a bottle is absurd, but should the lip of the bottle have been defiled by the animal, the taste will no doubt be imparted to the contents when poured out.

P. MURINA, *L.*

Brownish-grey above, greyish-brown below, the fur longer and coarser than in *P. indica*. Ears large and nude. Size a little less than the last, and the musky odour far less powerful.

Inhabits the Malayan Peninsula, ranging into Burma according to Jerdon, but this is doubted by Blyth.

P. GRIFFITHII, *Horsfield.*

Blackish grey. Teeth large. Ears small.

Head and body 5.75; tail 2.4 = 8.15 inches.

Ranges from the Khasi Hills into Arakan.

What the above species really is seems doubtful, as specimens so considered by Blyth are referred by Tomes to *S. earulescens*. Whilst profiting by these doubts, Anderson strikes in, as it would seem, and describes what probably is the same species under a name of his own.

P. BLYTH, Anderson (J.A.S.B. 1877, p. 264).

*S. Griffithii*, Horsf. apud Blyth.

*S. earulescens* (part), Tomes.

Colour a rich rusty brown, with a golden sheen, beneath rusty grey, some individuals much darker.

Adult female—head and body 5.00; tail 2.50; total 7.5 inches.

Inhabits Assam, Cherra and Arakan.

C. NEPIES, Blyth.

*C. macrotis*, Anderson.

Snout long and broad. Claws well developed. Fur short. Colour above shining dark brown, lower half of ears, chin and feet yellowish-brown. Ears very large and rather patulous. Limbs rather feeble. Short haired from the elbow and knee downwards, feet only sparsely covered with short brown hairs.

Adult female—head and body 1.75; tail 1.27; total 4.02 inches.

Inhabits Tenasserim.

As in Dr. Anderson's opinion the feet are not more nude than in other species, he claims to rename it himself, but a difference of opinion on a comparative character of this sort is no warrant for setting aside the original name bestowed by its first discoverer; besides, it was not the sole point of discrimination, the largeness of the ear being also adverted to by Blyth.

### Family Tupaiidæ.

TUPAIA, *Raffles*.

Dentition, I.  $\frac{4}{6}$ ; C.  $\frac{6}{6}$ ; P.M.  $\frac{6}{6}$ ; M.  $\frac{6}{6}$ .

Orbits complete. Mammaræ four. Habits diurnal. Uniparous.

T. BELANGERI, Wagner.

*T. Peguana*, Jerdon.

The Pegu tree shrew. Tswai.

Colour dusky greenish-brown—lighter below, and with a pale buff line. A stripe from the throat to the vent, broadest between the fore arms. Ears livid red.

Head and body 7.33; tail, with hair, 6.80=14.13 inches.

According to Jerdon, it ranges from Sikkim to Arakan, including Tenasserim, and Blyth adds: "common throughout British Burma," south of which it is replaced by *T. ferruginea*, Raffles, of which Blyth considers it as little more than a local race. Col. MacMaster describes them as residing in trees, but freely entering houses, adding: "I cannot indorse Jerdon's statement regarding their extraordinary agility, for they did not appear to me to be nearly so active as squirrels, at least I remember one of my terriers on two occasions catching one, a feat which I have never seen any dog do with a squirrel. Cats of course often pounce upon them." Dr. Mason records that "one that made his home in a mango tree near my house in Young-ngoo, quite uninvited, made himself nearly as familiar as the cat. Sometimes I had to drive him off the bed, and he was very fond of putting his nose into the teacups immediately after breakfast and acquired quite a taste for tea and coffee. He lost his life at last by incontinently walking into a rat trap. Some years afterwards another one adopted the habit of coming into the house almost daily for several months. He displayed great tact in getting off the top of the sugar-bowl, sugar seeming to have more attractions for him than any other article of food. He was a great pet, but though very quick in his movements, the cat came on him unawares one day and he lost his life." Blyth remarks: "In the vicinity of Malacca the small *T. javanica*, Horsf., is associated with *T. ferruginea*, though

unnoticed in Dr. Cantor's 'Catalogue of the Mammalia of the Malayan Peninsula;' and perhaps the most extraordinary instance in the class of what has been termed 'mimicry' occurs in a squirrel, *Rhinosciurus tapaioides*, Gray, differing little, if at all, from *Sciurus laticaudatus*, S. Müller, of Sumatra and Borneo, which inhabits the same district. Not only does this rodent resemble *T. ferruginea* in size and the texture and colouring of its fur, but the muzzle is singularly elongated, and there is even the pale shoullder-streak usual in the genus *TRAPIDIA*. As a group of *Insectivora* the Tupayes would seem to 'mock' the squirrels; but the particular species of squirrel referred to again specially simulates the *Tupaia ferruginea* of the same locality."

As regards the identity of *T. Peguana* and *T. ferruginea*, Mr. W. T. Blanford remarks: "Skins collected by Mr. Davison in Southern Tenasserim have all the posterior portion of the back distinctly ferruginous. Others from Myáwadi, west of Maulmain, are almost equally rufous on the rump, while other specimens again, from the same neighbourhood, have no rufous tinge. A specimen from Tavoy has scarcely a trace of rufescent. Without a larger series of Malacca specimens than I have at hand, I cannot positively say that the two forms pass into each other; but I am strongly disposed to suspect that they do." A better ground for separating these species appears to have been detected by Dr. Anderson, who remarks, "The skull of this species (*T. Peguana*) is distinguished from the skull of *T. ferruginea*, by the less elongated character of the facial portion, and by its smaller size. . . . The teeth are smaller than in *T. ferruginea*, and the second upper premolar wants the internal cusp and the cusp on the anterior margin, both of which are unmistakably developed in the last mentioned species; but these structures are nevertheless represented in the present species by little more than a ridge in the first, and in the second by an obscure tubercle."

It remains, however, to be shown if these and other differences are graduated as the colouration is, and the result of one being a small race of the other, or if they hold good, and can be discriminated, in the area (Tenasserim) where the two races are said to meet and coexist.

#### T. FERRUGINEA, Raffles.

Rich dark ferruginous above, yellowish below, washed with ferruginous. Tail greyish. Shoulder streak more or less rufous. Dr. Anderson adds, "The snout is longer than in *T. Belangeri*, and the species is larger," and this difference is seen in the skull characters; but it does not seem to be established whether these differences are constant, or graduate into each other, when a series of skulls is examined. What would seem to be the case is, that most of the so-called species are really local races, which, as our knowledge increases, it will be found necessary to amalgamate, as Dr. Anderson has so successfully done with the squirrels.

#### T. CHINENSIS, And.

Nearly allied to *T. Belangeri*, but paler and smaller.

Adult male—head and body 6·50; tail 6·16=12·66 inches.

Inhabits the Kakhyen Hills and the valley of the Upper Irrawaddy between 2000 and 3200 feet.

#### T. NICOBARICA, Zelebor.

The face and outside of the fore limbs, throat and chest golden, outside of the hind limbs, sides and abdomen, a rich rufous brown. The top of the head is rich dark brown, changing to pale golden brown between the shoulders, bordered by a maroon band. The rest of the back and tail almost black. Beneath the tail a yellowish brown central band.

Body and head 7·10; tail 8·00 inches.

The Nicobars.

### Family Hylomidæ.

Characters of genus, and intermediate between *Tupaia* and *Erinaceus*.

HYLOMYS, *Muller*.

Orbit imperfect. Pelvis posteriorly depressed.

Dentition, I.  $\frac{6}{6}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{8}{8}$ ; M.  $\frac{6}{6}$  = 14.

H. SCILLUS.

*H. Peguensis*, Blyth.

This species was named by Blyth from specimens received from Schwegyeng (J.A.S.B. 1859, p. 294); but that naturalist, after examining the Bornean animal, considered them identical.

Valley of the Sittoung, and Pongsee, in the Kakhien Hills at 3000, also Borneo.

Family **Erinaceidæ.**

GYMNURA, Vigors and Horsfield.

Dentition, I.  $\frac{2}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{8}{8}$ ; M.  $\frac{6}{6}$  = 14.

*G. RAFFLESII*, Vig. and Horsf.

Mr. W. T. Blanford thus describes the Tenasserim animal:—"This species was mentioned in Mr. Blyth's list of the mammals of Burma as probably existing in Mergui, although its occurrence within British limits had not been recorded. It has since been obtained at Bânkasûn in Southern Tenasserim, by Mr. Davison, to whom I am indebted for a perfect female in spirit.

"The skins from Bânkasûn vary much in the extent of white on the fore part of the body. Generally the head and neck are white, with the exception of a broad black patch above each eye and a variable amount of black bristles mixed with white on the crown. The anterior portion of the back is clad with mixed white and black bristles, the proportion varying; on the hinder back, sides, limbs and lower parts from the breast, the long hairs are generally black, but in one specimen there is a line of white bristles down the middle of the breast and belly; this line is wanting in the other two skins which I have examined. The extent of the white varies so much that it is not at all improbable that specimens wholly white or wholly black may occur. The fine woolly under fur is dusky olivaceous at the base, brown at the tips on the upper parts, ashy with brownish ends beneath. The terminal portion of the tail is compressed, and in some specimens partially or wholly white in colour, and the under surface of the tail is thinly clad throughout with scattered short bristles, about a quarter of an inch long. These bristles are wanting on the upper part of the tail, which has very much shorter scattered hairs. The small scales covering the tail are indistinctly arranged in rings, and subimbricate; on the lower surface the scales are convex and distinctly imbricate, the bristles arising from the interstices. Thus the under surface of the tail is very rough, and may probably be of use to the animal in climbing.

"The characters of the tail just mentioned, do not appear to have been noticed in the published descriptions of *Gymnura*, all of which are probably copied from that by Horsfield and Vigors. Another important difference from the original account is to be found in the claws of the specimens before me not being retractile. In the original description the retractility of the claws is mentioned, both in the Latin characters and in the English note pointing out the distinction between *Gymnura* and *Tupaia*. It is possible that the Tenasserim animal differs from that found in Sumatra, but the distinction between retractile and non-retractile claws would in all probability be of generic importance, and it is difficult to conceive that two genera of insectivora, so closely resembling each other in their very peculiar external characters, and yet differing in so important a detail, should inhabit two regions of which the fauna is, for the most part, identical. At the same time it is possible that I am mistaken in referring the Tenasserim animal to *Gymnura Rafflesii*.

"The following are the dimensions of the female specimen in spirit—

"Length from nose to anus,	. . . . .	12	inches.
"    of tail,	. . . . .	8.5	"
"    of ear from orifice,	. . . . .	0.94	"
"    of tarsus and hind foot (claws not included),	. . . . .	2.15	"

"The stuffed specimen is nearly the same, except that the tail is rather longer. The dimensions given by Horsfield and Vigors for an adult are rather more;—head and body 14·25 inches, tail 10·5, whilst the tarsus is stated to be only 2 inches long, but the difference is trifling.

"Mr. Davison informs me that *Gymnura* is purely nocturnal in its habits, and lives under the roots of trees. It has a peculiar and most offensive smell, not musky, but rather alliaceous, resembling decomposed cooked vegetables."

### Family Galeopithecidæ.

GALEOPITHECUS, Shaw.

Dentition, I.  $\frac{3}{1}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{4}{4}$ ; M.  $\frac{2}{2}$ ; total 34.

*G. VOLANS*, L.

The flying lemur. 'Myonk-hloun-pyan.'

Colour of fur olive-brown, with whitish patches, which render its body difficult to distinguish from the bark of the tree it frequents. A membranous fold, covered with fine hair, extends on either side from the fore to the hind limbs, and which is expanded as a parachute, when leaping from one tree to another. Mr. Wallace remarks that "it is sluggish in its motions at least by day, going up a tree by short runs, as if the action was difficult," and adds, "In a bright twilight, I saw one of these animals run up a trunk in a rather open space, and then glide obliquely through the air to another tree, on which it alighted near its base, and immediately began to ascend. I paced the distance from one tree to the other, and found it to be seventy yards; and the amount of descent at not more than thirty-five or forty feet, or less than one in five. This I think proves that the animal must have some power of guiding itself through the air; otherwise in so long a distance it would have little chance of alighting exactly upon the trunk. The *Galeopithecus* feeds chiefly on leaves, and possesses a very voluminous stomach and long convoluted intestines. The brain is very small, and the animal possesses such remarkable tenacity of life, that it is exceedingly difficult to kill it by any ordinary means. The tail is prehensile, and is probably made use of as an additional support when feeding. It is said to have only a single young one at a time, and my own observation confirms this statement, for I once shot a female, with a very small blind and naked little creature clinging closely to its breast, which was quite bare and much wrinkled, reminding me of the young of marsupials, to which it seemed to form a transition. On the back, and extending over the limbs and membrane, the fur of these animals is short, but exquisitely soft, resembling in its texture that of the Chinchilla." Raffles, however, states that it produces two young at a time, and Mr. A. Adams, who accompanied Sir E. Belcher in the exploring voyage of H.M.S. "Samarang," found two young in one which he dissected.

The range of the flying lemur is a wide one. It inhabits the Malayan countries and Tenasserim, and, according to Mr. Dunn, the Valley of the Koladyne River in Arakan, but has not been obtained in Pegu, although Major Spearman remarks that he saw one near the town of Bhecleng.

### B.—GYRENOCEPHALA.

Hemispheres of brain more or less convoluted, and extending more or less over the cerebellum and olfactory lobes.

#### Order CETACEA.

Nostril usually forms a blow-hole on the top of the head.

Anterior feet changed into fins. No posterior extremities. No external ears. Tail horizontal, a distinctive character of aquatic mammalia.

### Family Balænopteriidæ.

Head enormous. Teeth none, being replaced by transverse horny laminae (whalebone or 'baleen') adhering to the upper jaw. Bony teeth exist, however, in

the fetal animal. Mamme pudendal. Individuals of this family grow to 100 feet in length, and yield 600 to 800 plates of whalebone 12 to 15 feet long. The lower jaw is furnished with fleshy lips only, but neither teeth nor 'balcen.'

BALENOPTERA, *Lacépède*.

Head one-fourth of total length. An adipose fin on the back. Belly marked with longitudinal grooves.

*B. indica*, Blyth.

The Indian Rorqual, Finner, or Pike-whale.

Length of animal	. . . . .	1008 inches.
„ ramus of mandible	. . . . .	250 „
„ radius	. . . . .	35.6 „
Breadth of ditto	. . . . .	6.50 „

This animal was stranded on the Arakan coast.

*B. Edeni*, Anderson.

The Tsittoung or Eden's whale.

Length of animal	. . . . .	456 inches.
„ of mandible	. . . . .	119 „
Curvature of dor.	. . . . .	11.5 „

This animal was stranded in the Thaybyoo choung.

*B. Blythii*, Anderson.

Intermediate in size between *B. indica* and *B. Edeni*, and supposed by Anderson to grow to 60 feet.

Of necessity the materials for the study of these huge animals are fragmentary and imperfect, but Dr. Anderson has shown fair grounds for discriminating the above three species in Indian seas.

*Family Catodontidæ.*

Head enormous. Jaws armed with teeth.

To this family belong the sperm whales, so called from yielding the '*spermaceti*' of commerce, which is found fluid in large cellular cavities in their heads, but solidifies on cooling. Their hardened excrement constitutes '*ambergris*,' once so valued for its appetising smell and balsamic properties, and respecting which Balfour records that an excreted mass, picked up in Japan in 1693, and weighing 185 pounds Dutch, was purchased by the Dutch East India Company for £2000. Milton, it may be remembered, makes allusion to the culinary virtues of this substance.

"He spake no dream, for as his words had end  
Our Saviour, lifting up his eyes, beheld  
In ample space, under the broadest shade,  
A table richly spread in regal mode,  
With dishes piled, and meats of noblest sort  
And savour, beasts of chase or fowl of game.  
In pastry built, or from the spit, or boiled,  
Gris-amber steamed."—Par. Reg. ii. 337.

Doubtless the origin of this substance in the bowels of a whale was unknown to our ancestors who flavoured their dishes with it.

The temper of the *Cachalots* is fierce and uncertain, and they are dangerous animals to wound or meddle with.

*Family Delphinidæ.*

Teeth numerous, conical. Head moderate.

ORCELLA, *Gray*.

Head round, blowhole crescentric, convex posteriorly. Pectoral fin moderate. Dorsal behind the middle of the body. Projecting snout none. Food crustacea and fish.

*O. FLUMINALIS*, Anderson.

Colour pale slaty above, whitish below.

Length from snout to fork of tail . . .	90	inches.
„ from the snout to the dorsal fin . . .	55.75	„
Tip of snout to the base of the pectoral fin . . .	18.75	„
„ to the blowhole . . .	10.00	„
Length of dorsal fin . . .	4.75	„
„ of pectoral fin in front . . .	17.00	„
„ „ behind . . .	11.75	„
Girth over the blowhole . . .	28.25	„
„ in front of the pectorals . . .	39.35	„
„ at the base of the tail . . .	9.00	„

Teeth  $\frac{3}{2}$ , but many disappear with age, and their sockets are more or less obliterated.

Inhabits the Irrawaddy above the influence of the tides.

Blyth also records *Delphinorhynchus rostratus*, F. Cuv., from the Nicobars.

## Order SIRENIA.

*Herbivorous cetaceans.*

Nostrils opening in the upper lip. Teeth of two kinds, incisors, preceded by milk teeth, and molars with flat crowns. Mammeæ two, pectoral. Head of moderate size. Body as in the cetacea. Algivorous.

Family **Halicornidæ**.HALICORE, *Illiger*.

Dentition, I.  $\frac{2}{6}$ ; C.  $\frac{2}{6}$ ; P.M.  $\frac{1}{3}$ ; M.  $\frac{3}{3}$ ; in the adult.

In the young I.  $\frac{4}{4}$ ; P.M. and M.  $\frac{1}{6}$ ; according to Kelaart.

**H. DUGONG**, *Erxleben*.

Colour uniform bluish, sometimes blotched with white below, or pale fulvous above and white below.

Grows to 10 feet or more.

Inhabits the shores of the Bay of Bengal and Burma, especially delighting in estuaries and the mouths of rivers, and is common in the Andaman Islands and the Mergui Archipelago, where it was first noticed by the Rev. S. Benjamin, in 1853.

The flesh of the Dugong is excellent eating.

In the seventh volume of the Records of the Geological Survey of India, p. 142, I have discussed the question as to what animal, the Sanscrit term 'jala hasti,' or water elephant, was really applicable, as some scholars have supposed that it may have applied to the now extinct Hippopotamus of the Nerbudda. Dr. Falconer's mature conclusion was that that animal must have been extinct long anterior to the occupation of India by a Sanscrit-speaking race, but that the animal may possibly have coexisted in India with its earliest human colonists. The conclusion, however, to which I have come is, that the 'jala hasti' really applied to the Dugong.

## Order PROBOSCIDEA.

Family **Elephantidæ**.

Two incisors (termed tusks) in the upper jaw, none in the lower. Snout elongated into a long prehensile proboscis. Mammeæ two, pectoral.



## ELEPHAS, LINNÆUS.

E. INDICUS, Cuv.

Wild elephant. Tor-hsen.

The Indian elephant belongs to the subgenus '*Euclephas*,' of which it is the sole surviving member, whilst the African elephant is similarly the sole living representative of the subgenus '*Loxodon*.' In addition to differences in the teeth, the Indian elephant has a less rounded head than the African, and very much smaller ears, and one pair fewer ribs. The caudal vertebrae in the Indian animal are, moreover, according to Jerdon, 33, but in the African only 26, a longer tail in the former compensating for its shorter ears, as a defence against insects.

The period of gestation in the elephant would seem to be somewhat variable. Prof. Owen quotes one case of 595 days, another of 593, and Col. Heysham another of 593, and alludes to one of similar length. So that 593 or 594 days may be assumed as the usual duration with Indian elephants. But this period is sometimes exceeded, as in the Zoological Gardens, Philadelphia, a case of gestation is recorded of 629 days, which displays a variation in length of over a month, but it is not stated if the animal in question was an African or an Indian one (Trans. Zool. Soc. London, vol. xi. p. 129 and Proc. Zool. Soc. Lond. 1880, pp. 23 and 223). It is just possible, too, that the inappropriate food supplied to the animal in America may have had the effect of prolonging gestation, as privation is known to do, in the human female.

These valuable animals are subject to many diseases, one of which is thus described by Dr. Mason:

"The Bghais, in part of Ko-oung in Tounng-ngoo, reported that in one year as many as thirty-eight elephants had died with a swelling, sometimes on the breast, sometimes on the legs, and sometimes on the rump. The swelling is local, does not spread to other parts of the body, and they die usually the same day they are attacked, and sometimes in a couple of hours. They seem to be poisoned, as their flesh becomes poisonous. A man, too, brought down the tusks of one that had died, carrying them on his shoulder, and the part that had been in contact with the tusks swelled up. Moreover, the man, in cutting out the tusks, allowed the blood of the dead elephant to strike his legs, and his legs swelled up like the elephant's legs. My informant watched one man who was taken in the legs. His legs swelled up, and the swelling passed up to his bowels until he died, but the man complained of no pain, and was sensible, and could talk till he died, being five or six days from the time he was taken ill, but he lost all appetite, and did not eat rice after the attack.

"When a Karen has a good male elephant, he hires it out sometimes to the the Burmans, and gets fifty rupees a month. This, so far as I have ever heard, is the maximum. Then, if he can obtain constant work for it, he always lets it rest the three hot months of the year, lest it should be killed by overwork. The gross annual income therefore for a good male elephant amounts to 450 rupees."

The Burmans have a superstition regarding the elephant very similar to that which prevails in some parts of India regarding the tiger, to the effect that the spirits of such human victims as he may have killed, ride on his head, and serve to warn him of any dangers from pitfalls or hunters who may be plotting his death or capture. The Burmans regard it therefore as a very hopeless attempt to pursue, or even fire at, an elephant which has killed many men, from the protection which he consequently enjoys from their spirits in attendance on him.

It should be known that an elephant when tracked will as a rule 'head back' and return along the path he has just passed, which I presume he does to avoid the anticipated risk of being driven into a trap or pitfall; and I know of a fatal case resulting from the ignorance or disregard of this habit of the animal. A large tusker made his appearance in the rains opposite Myanoung on the Irrawaddy, and it was feared he would drive off some female elephants belonging to the Forest Department, which had been turned out into the forest to feed. A party therefore started from Myanoung to kill or drive him away. The ground was a swampy plain, covered with water and tall elephant grass, through which almost the only way for a man on

foot to go was by keeping to the path made by the elephants through the grass. A Burman tracker led the way, followed by two European forest officers with rifles, and a long line of armed Burmans bringing up the rear. All were in single file picking their way along the path the elephant had just taken.

Directly the elephant scented his pursuers, down he came. The leading Burman was struck down and crushed on the spot; a volley of musketry from the men behind followed, but the elephant charged through the midst and was never more seen. One European found himself in a tree on one side of the road, and the other was similarly hurled in an opposite direction, and their followers were equally unceremoniously disposed of. When they had all reassembled, the European officer, who had been in front, complained that his foot was injured, as he supposed by the elephant, and he was carried home, but on examination it was found that a bullet had gone through his foot, probably whilst in the air, and he died of tetanus in a few days.

A similar instance occurred to myself. I was crossing the Arakan mountains with twenty porters and two guides. The road lay down a valley through virgin forest, and elephants were numerous. At one spot the guides said an elephant had just passed, and asked leave to follow it up, and shoot it for its flesh. I accordingly halted the party in the bed of a broad stream, and the two guides, each armed with a musket, started in pursuit of the elephant, which they declared was not far off in the forest. In about five minutes or a little more, two shots were heard, and instantly every porter commenced ascending the tree nearest to him, leaving me and one or two servants standing alone in the bed of the stream, not a little astonished by the behaviour of my men. Almost immediately, however, the cry was raised, "He is coming!" and I at once comprehended the situation, and bolted for a high bank near, but had scarcely reached it, when a fine young male elephant, with tusks about a yard long, rushed past me within twenty yards, and disappeared in the forest, and we saw no more of him. Across the forest path, along which he came, a huge tree had been blown down, and below its trunk there was a clear space of some three feet. Beneath this trunk, on this very path, one of my servants, who was no better climber than myself, squatted, supposing the tree would turn the elephant. But no, he came straight for it, and scrambled over it, leg after leg, in a wonderful fashion, actually knocking off the man's turban, who was paralyzed by fright. It is probable he never saw the man, at all events he made no attempt to touch him; but it was clear that the elephant, on being fired at, had turned round and retraced his steps along the very path on which we had struck his trail.

There is a striking contrast between the treatment of an elephant by a Burman or Karen, and by an Indian Mahout. In Burma an elephant is driven with a short and light piece of bamboo, not shod with iron, in place of the cruel and ponderous iron goad used in India, the result being that the head of an elephant belonging to a Burman or Karen is as sound as any part of its body, instead of being, as is too often the case in India, a mass superficially of ecchymosed tissue, infiltrated with pus. It were well if it could be said that the ignorant Indian Mahout was the chief offender as regards the brutal usage of these poor creatures in India. But much of the suffering and misery undergone by elephants must be laid to the door of the responsible European Officers in charge of Government elephants, who, by their ignorance of the habits of the animals they are paid to look after, cause their lives to be passed in ceaseless misery. An elephant is very impatient of the sun, and suffers greatly by exposure to it. Yet in all our cantonments these animals are tethered out in the full glare of the mid-day sun, instead of being, as they should be (in default of forest shelter), housed in well-roofed sheds. A Karen is too wise and too careful to expose his elephant in this fashion to torture and injury. If it dies or goes blind, the loss is his. The well-salaried official, however, who has perhaps 50 Government elephants under his charge, knows or cares nothing for this. If they die, he simply buys others. Their sufferings touch neither his heart, nor his pocket; and if the '*sahib bahadur*' is so careless, how can one blame the rapacious and obsequious '*Gomashtha*' crew for not instructing him in his duty, and in some elementary ideas of the requirements of the animals in his charge? Who has not seen these poor brutes, tethered in

the '*lines*' or '*pil-khand*' of our cantonments, the live-long day, in a blazing sun, endeavouring to shelter themselves from its cruel rays, by heaping straw or dust and rubbish on their simmering heads? It is a cursed sight, and were the delinquent, in place of a high official, some wretched owner of hack ponies, he would soon find himself in the grip of the criminal law, if he did not alter his ways; and yet to persistently expose a nocturnal animal like the elephant with its sensitive skin to the full glare of the tropical sun, is at least as cruel, and far more injurious to its health, than working a hack pony or horse with a sore back—a good modern illustration of the adage that it is safer for some men "to steal a horse than it is for another to look at the animal over a gate."

The skin of an elephant is thick, but it is vascular and sensitive, and in the forests an elephant is often seen covered with blood from the attacks of flies. The back consequently readily 'galls.' I myself once returned a Government elephant, of which I had the loan, with a slightly sore back, which rest and a water dressing would have cured in a few days. How many weeks elapsed before the animal was reported fit for duty, I do not remember; but I was called on to pay for something like a hundredweight of pitch plaster for the wretched beast. The only wonder is that he ever got well at all, if this heating mess was honestly applied, which I hope it was not. The notions of Mahouts and other natives about curing wounds are curious. They imagine that maggots help to dry up a sore, and so tie up an animal's tail, that he may not disturb the blowflies, or hinder the deposition of maggots in a wound.

As is well known, male elephants become seasonably very excitable and dangerous, or '*must*,' as they are called in India, and during the height of which paroxysm a thin fluid trickles from a minute orifice in each temple, analogous to the exudation which is secreted by certain glands at the back of the neck of male camels, giving that part the appearance of being moistened with thin treacle; and this temporal exudation is frequently alluded to in Hindu poetry as a familiar phenomenon, though so unobservant are too many Europeans of the marvels of nature that some hardly know that such a phenomenon exists. The late popular excitement, however, and the cause which led the Zoological Society to part with their old friend 'Jumbo,' has somewhat contributed to make more generally known the fact that occasionally, that is, when '*must*,' the male elephant is a very dangerous and unmanageable animal. In India the general treatment, elephants at this time are subjected to, is strict confinement and low diet, but a better plan, when practicable, is to turn the animal loose in the forest, near water, whence, if a female elephant is tethered near him, he will never wander far, and may soon be reclaimed. It sometimes, too, happens, through stupidity or fear, that the animal is tied up, and no proper means provided to supply him with water, in which case he soon becomes maddened with thirst, which is all put down to his being '*must*' by the ignorant wretches in charge of him. This was the case with an elephant that I once saw tethered near the circuit house at Prome, and the first thing this poor beast did, when it did break loose, was to walk down into the river to drink. I marched towards Allan-myo the next day, and at my first halting-place again made the acquaintance of this animal, now at large. I had marched with three female elephants, and encamped as usual along the road-side. I had turned into bed, when I was roused by hearing my elephants rush past my tent, and on getting up, my Mahouts told me they had turned the elephants loose for them to escape into the jungle, as the '*must* Elephant' was coming up the road, and, sure enough, I could distinguish the clink of a bit of chain which still remained attached to his leg. There was indeed now no doubt that he was following the track of my camp, in pursuit of my elephants, and he was followed at a respectful distance by his own Mahout, mounted on another elephant, for the purpose of watching his movements. The word was now quickly passed for every one in camp to shift for himself, and we were soon all of us inside the village. Ere long the elephant passed through the camp, and, not detecting the elephants, went further on. As soon as it was light, I secured my elephants, struck camp, and marched off through the jungle to evade pursuit. I had hardly quitted the ground, before back came the elephant, who had evidently found that he had overshot his mark, and after destroying

a rice bin in the village, and seriously injuring by a charge his Mahout, who was endeavouring with a spear to repel him, he eventually returned to near Prome, and was, I believe, in a month or so secured by a Burman; but again, I think, broke loose and was shot, but of this I am not sure. Before reaching my camp, he came across two men asleep on the road-side, one of whom he killed, but whether he killed many more I do not know, but the damage he did was immense. Now all this loss of life and property and the sort of state of siege the whole country was thrown into whilst he was at large, might have been avoided by a little common sense on the part of the owner, the Commissariat Department. All disastrous consequences would have been avoided, had the animal, when first becoming '*must*,' been sent out into the forest, where water was procurable, and one or two female elephants been turned out with simple shackles on their feet to keep him company. Instead of being a source of terror and annoyance to a whole district for months, he would, if treated as suggested, have been reclaimable in the course of a few weeks.

A somewhat similar adventure happened to me on the opposite side of the river in the Mayanoung district. I was marching for a particular village, when I was warned by some men to be on the watch, as a '*must*' Elephant belonging to some timber merchants was about. I accordingly pushed on ahead of my three female baggage elephants, towards a village on my road, and was met at its outskirts by the headman, who told me the elephant in question was on the other side of his village, standing in the very road I had to take, and, sure enough, on going through the village, there he was, standing waiting for us! I had just time to send back to order a halt, and after a brief consultation, altered my line of march to another village, without his catching sight of my elephants, though he may have got their wind. That night passed without interruption, and the next day I reached the village I should have, the previous day, but for this interruption. I could at first get no tidings of the whereabouts of my friend; but towards evening, men dropping in, reported having seen him in the neighbourhood, and we all prepared for an anxious night. As evening drew on, other elephants were brought in by various owners, and securely fastened up in the village. My three elephants were tied up to trees and houses, and I requested a police-guard might be furnished during the night in case the animal should attack us. Having seen all things snug, as sailors would say, and eaten my dinner in a '*Ziat*' just outside the village, I took my usual evening walk up and down a little path close to the '*Ziat*,' bounded on each side by high grass, but close to the village, and within sight and hearing of my people. I had walked backwards and forwards about ten minutes, and it was getting dark, when, as I turned to return to the '*Ziat*,' I heard a '*flap*,' which I recognized, or thought I did, as that of an elephant's ear thrown back on his neck. I instantly stood motionless and listened intently, but as no other sound was audible, I thought I was mistaken, and that it was a dead palm-leaf which must have flapped on a tree close by. I therefore returned to my '*Ziat*,' and was on the point of calling for tea, when a terrible uproar ensued, and I heard a heavy tramp close by, followed by the shrill trumpetings of all the elephants in the village, the rending sound of ropes and chains, the shouts of men, and here and there a shot or two. Before I had time to recover from my surprise, I saw the form of my Burmese interpreter flash past me, his long hair streaming comet-wise behind him, revolver in hand, and disappear into the jungle, followed by some of my pluckiest servants. I at once saw the extent of our misfortune. The '*must*' Elephant had crept stealthily up, and when I heard him, was probably not five paces from me, and had a few minutes later charged into the village, causing every elephant to burst its bonds, and take to flight into the jungle. My three had all disappeared, but as one was very wild and difficult to retake when loose, I had luckily put additional shackles on her fore feet, which prevented her going far; but my largest female was missing, and next day we found she had been carried off, and I did not recover her from her ravisher for upwards of a fortnight, and eventually she produced a calf. Had the elephant which gave us all this trouble been a wild one, it would have been easy to have shot it; but as it was a valuable animal, the property of some timber merchants, I had to wait patiently till I could secure my female, and this was not easy, as she was jealously guarded by the other, and my men could not get near her.

It is a common, and in my opinion pernicious plan to anoint an elephant's head with oil, as it not only darkens the colour of the skin and renders it more receptive of heat, but clogs the pores. A far preferable plan, I can certify by long experience, is to give a coat of pipe-clay or whiting over the elephant's head before he goes out. This on drying turns white, and keep the head cool, enabling the animal to travel much later in the day than he otherwise would, and in comparative comfort. As, however, the Mahout cannot use a moiety of the pipe-clay in his curry, it is a plan which never fails to be strenuously objected to. It is an excellent and most humane one nevertheless. *Crede experto.*

## Order UNGULATA.

a. *Perissodactyla.* *Toes uneven in number.*

### Family Rhinocerotidæ.

RHINOCEROS, *Linnaeus.*

Feet with three toes. Head with one or two horns behind the nose. Dentition variable. Molars complex, and characteristic of the species.

R. SONDAICUS, F. Cuv.

The lesser one-horned Rhinoceros. Kyan-lsen. 'Elephant Rhinoceros.'

Mr. Blyth's remarks on the Rhinoceroses of Burma are so interesting that I quote them at length:

"The Lesser one-horned Rhinoceros. So far as I have been able to satisfy myself, this is the only single-horned Rhinoceros of the Indo-Chinese and Malayan countries, its range of distribution extending northward to the Gáro hills, where it co-exists with the large *R. indicus*, and to eastern and Lower Bengal. It would appear to be the only Rhinoceros that inhabits the Sunderbans, occurring within a few miles of Calcutta; and yet I know of but one instance of its having been brought to Europe alive, and then, it was not recognized as differing from *R. indicus*, which latter is not uncommonly brought down the Bráhmáputra from Assam, and sent to Europe from Calcutta. There is reason, also, to believe that *R. sondaicus* is the species which was formerly hunted by the Moghul Emperor Báber on the banks of the Indus. Southward it inhabits the Malayan Peninsula, Sumatra, Java, and Borneo. It is about a third smaller than *R. indicus*, from which it is readily distinguished by having the tubercles of the hide uniformly of the same small size, and also by having a fold or plait of the skin crossing the nape, in addition to that behind the shoulder-blades. In *R. indicus* the corresponding fold does not thus meet its opposite, but curves backward to join—or nearly so in some individuals—the one posterior to the shoulders. A fine living male, before referred to, was exhibited for some years about Great Britain, and was finally deposited in the Liverpool Zoological Gardens, where it died, and its preserved skeleton is now in the anatomical museum of Guy's Hospital, Southwark. Two passable figures of it from life are given in the 'Naturalists' Library,' where it is mistaken for the huge *R. indicus*."

Dr. Mason writes thus of this species: "The common single-horned Rhinoceros is very abundant. Though often seen on the uninhabited banks of large rivers, as the Tenasserim, they are fond of ranging the mountains, and I have frequently met with their wallowing-places on the banks of mountain streams two or three thousand feet above the plains. They are as fond of rolling themselves in mud, as a hog or a buffalo. The Karens when travelling have quite as much fear of a rhinoceros as they have of a tiger. When provoked, the rhinoceros, they say, pursues his enemy most unrelentingly, and with indomitable perseverance. If to escape his rage the huntsman retreats to a tree, the beast, it is said, will take his stand underneath for three or four days in succession, without once leaving his antagonist. There are seasons when the rhinoceros is very dangerous and ferocious, attacking everything that comes near its haunts, yet it is believed the stories related of them are exaggerated. In the Latin Vulgate the rhinoceros is put where unicorn is read in the English Bible, and

a similar rendering has been adopted in several Indian versions, though unsupported by any philological considerations. The Hebrew name '*reen*' bears no resemblance to the name of the rhinoceros in any of the countries adjacent to Judea. In Persian it is called '*karg*.' The Southern Karens say there is a third species of rhinoceros in the jungles, which is distinguished from both the others by its skin being covered with small tubercles, and above all by its eating fire. Wherever it sees fire it runs up and devours it immediately. I once lost my way among the hills and valleys of Palaw and Katay, and on obtaining a Karen, who lived in that region, for a guide, he laid special charge on every member of the party to follow him in silence, for a fire-eating rhinoceros had been recently seen, and it always came to noises, instead of fleeing from them as most animals do." Dr. Mason goes on to state that a similar dislike for fire is well known in the black African rhinoceros, and has been recorded by Blyth of *R. Sumatrensis*, and it may not improbably exist in other species of the genus. The habit of attacking a fire and trampling it out (the eating part of the performance being probably an embellishment) may have originated in the sagacity of the animal or to the mixed operation of fear and rage combined, as a savage dog will pursue and bite the stone thrown at it; and in time an act wholly unconnected with the natural economy of the animal, and developed by an accidental circumstance, may, by the operation of the laws of heredity, have become converted into an instinct. This idea receives some support by the behaviour of bees. When preparing to smoke off a swarm of bees from their comb in the jungle, especial care is taken by the Burmans not to allow the flame to rise, or to 'crackle,' as the bees are said to be at once roused to fury by the sound of flames, and to attack every one within reach. Doubtless experience has taught them the danger to their home which attends a crackling fire in the wood, and they at once resort to the weapon of offence with which they are provided. A rhinoceros is actuated by precisely the same sentiment, and he rushes to the detested fire and tramples it beneath his feet as he would a living enemy.

R. LASIOTIS, Selater.

*R. Crossii*, Gray.

Ear-fringed two-horned Rhinoceros.

Blyth inclines to unite this species and *R. Crossii*, Gray, which has an anterior horn sometimes 32 inches long. Blyth remarks: "In the Rhinoceroses of this type the hide is comparatively thin, and is not tessellated or tuberculated, nor does it form 'a coat of mail,' as in the preceding, but there is one great groove (rather than fold or plait) behind the shoulder-blades, and a less conspicuous crease on the flank, which does not extend upwards to cross the loins, as represented in F. Cuvier's figure; and there are also slight folds on the neck and at base of the limbs; the skin being moreover hairy throughout. There is also a second horn placed at some distance behind the nasal one. Until recently the existence of more than one species was unsuspected. In 1868 a young female was captured in the province of Chittagong, and on its arrival in the London Zoological Gardens, early in 1872, was believed to represent the *Rhinoceros sumatrensis* of Bell and Raffles; but soon afterwards another two-horned Rhinoceros was received at the same establishment from Malacca, obviously of a different species, which proved to be the veritable *R. sumatrensis*. Since its arrival, it has now (1873) considerably increased in size, and it probably is not yet quite full-grown. As compared with *C. sumatrensis*, it is a considerably larger animal, with much smoother skin, of a pale clay colour, covered with longer and less bristly hair, the latter of a light brown colour, as seen in the mass. The ears are placed much further apart at the base, and are not lined with hair as in the other, but are conspicuously fringed with long hair; and the tail is much shorter and largely tufted at the end. The horns are worn away, but if the species be truly assigned to *C. crossii*, the anterior would grow very long and curve to a remarkable extent backwards, while the posterior horn would probably be short. A second specimen of an anterior horn, almost as fine as the one first described, has recently turned up among the stores of the British Museum; and I found a smaller anterior horn of *R. crossii* in the Museum of the London Royal College of Surgeons, confirmatory of its peculiar

shape. In this group the horns are remarkably slender except at the base, and of much more compact texture than in other rhinoceros horns. I have reason to believe that this is the two-horned species which inhabits the Arakan hills, those of northern Burma, and which extends rarely into Assam; and I think it highly probable that the skull figured in Journ. As. Soc. B. xxxi. p. 156, pl. iii. f. 1, represents that of *C. crossii* (sen *R. lasiotis*), in which case the range of the species would extend into the Tenasserim provinces. A detailed notice of the individual sent to London has been given by Dr. Anderson (P.Z.S. 1872, p. 129)."

The skulls of a male and female of this species procured by myself on the coast near Koranji Island, in 1866, are now in the British Museum. A curious fact elicited during the transport of the Chittagong specimen, was her inability to swim. In crossing the Sungoo River she had to be towed across between two elephants, for she was unable to do more than just keep her head above water by paddling with the fore feet like a pig (see Proc. Zool. Soc. Lond. 1872, pp. 493 and xxiii).

*R. SUMATRENSIS*, Bell.

*R. Javanus*, F. Cuv. Very young.

*R. Blythii*, Gray.

Kyan.

The Sumatran Rhinoceros is much smaller than the preceding species, with a harsh and rugose skin, which is black, and clad with bristly black hairs; the ears less widely separated at base, and filled internally with black hairs; the muzzle anterior to the nasal horn much broader; and the tail conspicuously longer, tapering, and not tufted at the end. Horns attaining considerable length, and curving but slightly backwards, as represented in Journ. As. Soc. Bengal, xxxi. p. 156, pl. iv. f. 1.

In the Proc. Zool. Soc. for 1873 (p. 104), an account is given by Mr. Bartlett of the birth of a young one of this species, and from observations recorded in this case, the period of gestation would seem to be about thirty weeks. The newly-born calf was 3 feet in length, 2 feet high, and weighed a little over 50 lbs. The plate (*i.e.*) suggests the idea of the young animal being in poor condition, which may be accounted for by the fact of its mother having just performed the voyage from Singapore, and this may account for the early death of the calf, accelerated by the stupid exposure of the young one to cold and rain on shipboard. *Rhinoceros Sumatrensis* is the ordinary two-horned Rhinoceros of Tenasserim and the Malay countries, and would seem to be replaced in Arakan by *R. lasiotis*, which perhaps also spreads into Assam and Tenasserim.

'Kyan' is the generic name for a Rhinoceros in Burma, from a root, according to Dr. Mason, signifying "to be firm in structure or mind," and its horns and blood are extravagantly valued by the Chinese for their medicinal properties.

As regards the occurrence of *R. indicus*, Cuv., in Burma, Blyth thus sums up the evidence *pro* and *con*.

"According to Helfer, the *R. indicus*, in addition to *R. Sondaicus*, inhabits the northern portion of the Tenasserim Provinces; and Mason asserts that a single-horned Rhinoceros from the Arakan jungles was purchased by the London Zoological Society, and lived for many years in the Regent's Park; the species in that case was undoubtedly *R. indicus*. Again, according to a writer in the Oriental Sporting Magazine (July, 1832, p. 301), both species of one-horned Rhinoceros occur in Burma, and he cites, as his authority for the statement, a writer in the first series of the same periodical (vol. ii. p. 35), mentioning that his said authority appears to be 'a thorough sportsman and no mean naturalist.' I nevertheless hesitate, upon present evidence, to admit the great Indian Rhinoceros into the list of Burmese animals."

### Family Tapiridæ.

#### TAPIRUS.

Four toes in front, three behind. Snout produced into a short fleshy mobile trunk. Hair short and close.

Dentition, I.  $\frac{3}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{3}{2}$ ; M.  $\frac{3}{2}$ .

TAPIRUS MALAYANUS, Raffles.

The tapir. 'Ta-ra-shu.'

"The tapir has been long known to exist in the Southern provinces, but has never been heard of north of the valley of the Tavoy River. It is believed that none have ever been killed or captured in the Provinces except one that was procured from a Karen, by a writer of the late Major Macfarquhar at Tavoy. It was a very inoffensive animal, and became as much domesticated as a cat. It followed its master round the compound like a dog, but looked as unseemly as a hog. It differs in no respect from the descriptions of the Malay tapir, has the same white-blanket-like appearance on its back, and like that frequents the uplands. Though seen so rarely, the tapir is by no means uncommon in the interior of Tavoy and Mergui provinces. I have frequently come on its recent foot-marks, but it avoids the inhabited parts of the country."

*b. Artiodactyla. Number of toes even.*

*Family Suidæ.*

*Sus, Linnaeus.*

Four toes on all feet, toes separately hoofed. Canine large in the males. Molar teeth tuberculate.

*SUS CRISTATUS, Wagner.*

Tor-wet. Wild hog.

Mr. Blyth remarks, "A boar which I examined at Akyab was the ordinary Bengal race, but the Tenasserim wild boars are considerably smaller, the skulls of adults being one-fifth less in linear dimensions, though otherwise similar. The race requires to be critically examined. That pigs are inimical to snakes is well known, but Mason mentions that he has seen the head of a Python 'that was killed by a drove of hogs, whose whole length measured 18 feet.' It is a remarkable fact (if quite trustworthy) that a number of hogs should thus combine to destroy a large Python."

*S. ANDAMANENSIS, Blyth.*

Dentition, I.  $\frac{3}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{3}{3}$ ; M.  $\frac{3}{3}$  = 44.

More than twenty years have now elapsed since Blyth first indicated this species (J.A.S.B. May, 1858), and we know as little of the anatomy of one of the most remarkable and best characterized vertebrates of the Andamans as we did then. The adult boar's skull would seem to be 10.25 inches in length, with a breadth of 4.5 inches. Mr. Blyth remarks (*l.c.*), "From the size of the skull of the adult boar it may be estimated that this animal would not exceed 15 inches in height, if indeed it is even so high at the shoulder. The skull is much less elongated, anterior to the orbit, than in ordinary swine, that portion occupying somewhat less than three-fifths of the entire length. Profile a little concave anterior to the eyes, the forehead bulging into a convexity."

This species, Mr. Blyth remarks, most requires comparison with *Sus Papuensis* of New Guinea, but as yet the soft parts of the animal appear to be undescribed. Gray remarks, "The skull of this species is more nearly related to the *Babirussa*, than any others of the pigs (*Sus*)" (Proc. Zool. Soc. Lond. 1868, p. 30).

*c. Ruminantia.*

The ruminating section of the Ungulata possess four stomachs, thus described by Jerdon. The paunch or first stomach is capacious, with two well-marked constrictions. The second stomach is small and globular, and called by some the honey-combed bag, being lined with polygonal cells. The third stomach, or "*monyplies*" of the Scotch, is small and subglobular, but much increased in capacity by the folding of the lining membrane. The fourth or last stomach is the true digestive sac, one-third the size of the paunch, and of an elongated pyramidal form.



*Family Tragulidæ.*

Canines in the males only. No eye, groin, or feet pits. No horns in either sex.

## TRAGULUS.

Characters of the family.

*T. KANCHIL*, Raffles.

The smaller mouse-deer.

Colour rufous or dark rufous, with a dark mesial stripe on the chest, bordered with white. Size that of a hare.

Ranges from the Malay countries into Tenasserim.

*T. NAPI*, F. Cuv.

The larger mouse deer.

Much larger and stouter than the last. Colour brown, with a dark stripe down the back of the neck, and five white stripes below the throat. Belly white.

Ranges into Tenasserim with the last, but is less common than it.

Mr. Blanford thus contrasts these two species:—

“As was suggested by Blyth in his remarks on *Tragulus kanchil*, the larger form of chevrotain is found in Southern Tenasserim, Mr. Davison having procured an adult and a young animal from Binkasón. Owing to the extreme confusion which formerly prevailed as to the synonymy of the *Traguli*, the nomenclature and distribution of the different species cannot be said yet to be rightly determined in all cases, but it is clear that two distinct forms are found in the Tenasserim provinces, and these forms appear to be the *T. kanchil* and *T. napu* of A. Milne-Edwards’ monograph of the *Tragulidæ* in the ‘*Annales des Sciences Naturelles*,’ as has already been pointed out by Mr. Blyth.

“The most striking differences between the two species are,—first, size; *T. napu* being probably thrice the weight of *T. kanchil*;—second, the much stouter limbs of the former; the length of the tarsus and hind foot in two specimens before me of *T. napu* and *T. kanchil* respectively being 5·85 and 4·8, whilst the circumference of each tarsus in the middle is 1·3 and 0·85;—and, third, colouration, especially below. There is but little difference above; both are brown, becoming paler and greyer on the sides, but the dark line from the nape down the back of the neck is much more distinct in *T. kanchil*. The colouration of the throat and belly, however, is very different; in *T. napu* there are five white stripes on the throat, one longitudinal in the middle, and two oblique stripes on each side, the upper lateral band being much shorter than the lower. In the adult skin from Tenasserim all these bands unite in front, but not in the young specimen, in which the median stripe is separated from the others, as described by Milne-Edwards. The interspaces between the white bands are dark brown, darker than the sides of the neck, but this appears sometimes to be the case in *T. kanchil* also. The abdomen in adult *T. napu* is mostly white, the breast and the space between the thighs purer white than the rest; in the young all the middle portion of the abdomen between the broad white breast and the narrower white groin is smoky brown; in both there is a rudimentary dark median band, not nearly so distinct as in *T. kanchil*.

“In *T. kanchil* there are but three white stripes on the throat, the median line being sometimes entirely distinct from the two broad and long oblique lateral stripes, sometimes coalescing with them in front; the abdomen is pale rufous and white in patches, the centre of the anterior portion and the sides of the posterior portion being white, and the remainder rufous, but the proportion of the two colours varies; there is, however, a well-marked dark median line along the anterior half, beginning from the dark transverse band on the breast.

“In both species the rump is rufous, and the tail brown above, white below and at the tip. All the differences noticed, except the number of white stripes on the throat, have already been pointed out by Blyth.”

*Family Cervidæ.*

Horns deciduous, and in all species (except the reindeer), confined to the males. End of muzzle nude and moist. Lacrymal pits present. Metatarsal glands on the hind legs, and sometimes feet pits in front or hind limbs. No gall-bladder.

Rusa, Hamilton Smith.

Horns with one basal and one upper tine. No feet pits.

R. ARISTOTELIS, Cuv.

The Sambhur deer. Tsat.

This deer is commonly diffused through Burma, but does not, according to Blyth, attain the same size or such fine horns as in Hindostan. The following are measurements of some Indian Rusa horns for comparison.

	1	2	3	4	5
Length along outside curve . . .	36	38	43	44	40½
Length of brow antler. . . .	13½	12¾	14	15	15½
Circumference at "burr" . . .	9	9	10¼	10	9½
„ below brow antler. . . .	13	10	—	—	11
„ above do. do. . . .	7½	6	7¾	8	—
Spread between tips . . . .	26	23½	—	—	34

## HYELAPHUS.

H. PORCINUS, Zimm.

The hog deer. Darch.

The horns of this species resemble those of a young spotted deer (*Axis maculatus*), with basal and upper tines very small. Regarding its distribution Blyth remarks:—

"The *Drai*, or Hog Deer, is very abundant. Mason observes, however, that this species seems to be confined to the plains. 'It abounds,' he states, 'north and east of Maulmain, and on the large islands south of Tavoy; but it is not found north of the station, nor eastward among the hills, nor in the valley of the Tenasserim, but is found again on the plains of the Sitang.' Some individuals (especially does) are more or less distinctly 'menilled' or spotted when in their summer coat, which has given rise to reports of the Indian Spotted Deer (*Axis maculatus*) having been observed in Burma."

They are very abundant near Rangoon, where a dozen or more may be seen in the market after a successful hunt in the rains. Mason says, "They are often hunted by persons in companies after dark, who go into the plains where they are found, beating tin kettles and ringing bells and gongs, which is said to bring the animals to a stand with astonishment, so that the huntsman can walk up and shoot them at his convenience." I have heard a somewhat different account of this method, which is undoubtedly practised. A dark night is selected, and two or more hunters start off to the spot deer are known to be in. One is armed with a sharp heavy knife or gun; the other carries a light on his head, and gently tinkles a bell. The deer are attracted by the sound of the bell, and advance up to the light, on which their every faculty is concentrated (probably not seeing the man who carries it), and so allow the confederate to creep up and hamstring several before the rest take alarm and disperse. Occasionally the hunters come across a tiger, who acts precisely as the deer do, and this brings the night's sport to a close, as the hunters extinguish their light and retreat as they best can.

## PANOLIA.

P. ELDI, Guthrie.

Thamme or Thamen of the Burmans. Sungrai, in Manipur.

Inhabits Manipur, and thence to Pegu and Tenasserim, Mergui, Keddah, etc.

The following particulars of this species are extracted from a paper by Capt. R. C. Beavan, in the Journal of the Asiatic Society of Bengal for 1867 (p. 175),

and the very first sentence quoted has the true ring about it of the born naturalist : "Pioneered by him (J. Davis, Esq., Superintendent of Police, Martaban District), early in October last, I visited the haunts of the *Thamen*, near Thatôn (a town about forty miles N.W. of Maulmain), and although, owing to the dense nature of the vegetation covering the plains at that time of the year, I was only able to see a few scattered females and young of the second year, yet the insight thus afforded into their habits and economy more than repaid us for the severe attack of illness I subsequently incurred, by exposure to the heat and wet.

"This plain of Yengyaing was then, owing to the recent and heavy falls of rain, one large swamp. Nearly the whole of its unbroken extent, which embraces an area of 14 miles in length, with an average breadth of 10, could be traversed in a small canoe, except here and there, where mud and vegetation combined, obliged me to resort to a very unpleasant system of half wading in water, and half sticking in deep slime. A continuation of this plain, broken up by belts of jungle, extends for several hundred miles up the Burmese coast, and has evidently been formed by the gradual retirement of the sea, which at one time doubtless dashed its waves against the Martaban and other continuous ranges of laterite hills. It is now, at Yengyaing, some eight to ten miles distant from the hills, and seems to be still retreating, since the water along the coast of this gulf of Martaban is very shallow and studded with sandbanks. For the primary cause of this we may doubtless look to the immense amount of silt deposit brought down by the waters of the Salween, Beeling, Sittang and Rangoon rivers, all of which discharge themselves into the Gulf of Martaban. As the sea retires, a belt of mangrove jungle about a mile in width appears to travel with it, thus inclosing the plain with a barrier of vegetation on one side, and the mountains on the other. This strip of mangrove jungle gives cover to numberless hog-deer, tiger, leopard, and pig, but is never entered by the *Thamen*, except where somewhat open; nor on the other side do they ever attempt to penetrate into the mountains. The plain is intersected by numerous tidal creeks, which in the hot weather, when deprived of water from the hills, appear to dry up to a great extent, and those still open at that time of year contain no admixture of fresh water, so that it is evident, that for two, if not three, months in the year, the *Thamen* must be entirely deprived of fresh water, whilst during the rainy season, for six months at least, they may be said to live in water. It appears wonderful how they can manage to exist in such extremes of heat and wet. With the exception of a few stunted trees, and a fringe of hibiscus bushes along the creeks, the plain is covered with nothing but grasses and paddy, of which latter both the wild and cultivated varieties are abundant: owing, however, to the paucity of the population and the consequent demand for labour in this immediate neighbourhood, perhaps only one-fourth of the whole area is under cultivation for paddy: this crop succeeds here admirably, and the grain forms one of the staple articles of export from Maulmain and other Burmese ports. The remaining three-fourths are covered with the indigenous uncultivated plants which, in seasons of scarcity, are reaped and used for food. This tract of country forms a vast grazing ground both for the *Thamen*, and for large herds of tame buffaloes which are during the rains pastured here by the Karens, but withdrawn into the heavy jungles near the hills, when, in April and May, the whole of the vegetation on the plain becomes parched up, or is devoured by jungle fires. At the time of my visit vast flocks of waders and other water-birds were arriving from the north, and the creeks were filled with pelicans of several species; whilst the mud flats absolutely swarmed with stints, sandpipers, egrets, and especially the rosy tantalus. Here and there, stalking gravely amongst the flowering paddy, might be seen pairs of the Sarus crane (*Grus antigone*), or a troop of adjutants, both of which breed in the neighbourhood. Occasionally the rarer Javanese adjutant was met with, and the Jabiru stork, *Mycteria australis*.

"The colour of a full-grown buck is dark brown, especially about the back and neck, with underparts lighter. The females are hornless, and in colour like the female sambar (*R. Aristotelis*), but perhaps a little lighter. The female gestates nearly seven months, and brings forth her young in October and November amidst the jungle paddy, which is then flowering or in seed, and at its greatest height. The doe will

breed a second time in eighteen months after bringing forth, so that the young of two seasons are not unfrequently seen with their parents. Females produce but one at a birth, and the young are spotted or mottled, but this disappears with age. In the second year the males first begin to acquire horns, which are perfectly developed in March, and shed about September. After two years they get two tines, and when about seven years old are in their prime, with twelve tines, including the brow antler. The average weight of the buck is about 190 lbs.

Their habitat and range, according to Mr. Davis, are as follows: In the Martaban District they inhabit exclusively the open grassy plains between the sea and the mountains. In the Pegu plains they are perhaps more abundant than in any other part of Burmah; next to them the Yengyaing plain in Martaban produces most; near Rangoon they are found in the Dalkhi plain. About Pegu and Yengyaing they are found in herds from fifty to a hundred in the month of March, but when hunted, they congregate much more, and as many as two hundred may then be seen together. In habits they are essentially gregarious, and associate with no other species, although hog deer abound in the grass and jungle along the edges of the plain; nor will they allow the tame buffaloes to come nearer to them than about 100 yards. In habits they are very wary and difficult of approach, especially the males; they are also very timid, and easily startled. The males, however, when wounded and brought to bay with dogs, get very savage, and charge vigorously. On being disturbed, they invariably make for the open, instead of resorting to the heavy jungles like hog deer and Sambur. In fact, the *Thamen* is essentially a plain loving species, and although it will frequent tolerably open tree jungle, for the sake of its shade, will never venture into any composed of dense or matted under-wood, *i.e.* bush jungle in contradistinction to 'tree jungle.' Indeed I was credibly informed of a large stag which, being driven into a corner of the plain last year, by herd boys, with pariah dogs, and finding no means of escape, took refuge in heavy jungle, where its horns got entangled in a hibiscus bush, and so was actually captured alive.

"When first startled, their pace is great. They commence by giving three or four large bounds like the *axis* or spotted deer, and afterwards settle down into a long trot, which they will keep up for six or seven miles on end where frequently disturbed. This is when the vegetation on the plain is comparatively short. In the rains they do not go far before they find a hiding-place in the long paddy. Their powers of leaping are highly developed. On the Yengyaing plain alone there are at the present time about a thousand head; on the Thatong plain, a little further to the north-west, perhaps a hundred head only, which go about in small herds of seven or eight.

"An intelligent Burmese shikarree (hunter) told me that in former years, before Martaban was taken by the British, the '*Thamen*' were much more abundant than they are now, and the natives used to destroy them wholesale at battues: a large number of men would assemble from the surrounding villages and gradually encircle three or four moderately sized herds with long strings, upon which plantain leaves were tied so as to flutter in the wind. The circle originally formed at some distance was gradually lessened, as the deer, afraid to pass the scarecrows, got gradually driven together, until they were completely surrounded and at the mercy of the hunters. The object was to get them into a corner near the heavy jungle, into which if they attempted to run, they either became entangled or allowed their pursuers to get up quite close. My informant tells me that, in former years, he has himself seen as many as 150 to 200 killed in one battue. To such a length was this system carried, and such enormous havoc thereby created, that the Burmese Government, fearing that the species would be utterly exterminated, wisely put a stop to the practice. This shikarree informed me that five-and-twenty years ago he has seen as many as five hundred head in one herd, and his account was confirmed by others."

#### CERVULUS, *Blainville*.

Horns raised on bony pedicles, covered with hair. Large upper canines in both sexes. Two conspicuous longitudinal facial folds. Eye pits large and mobile.

C. AUREUS, H. Smith.

The Barking deer. Gyi.

Colour bright rufous bay. Inside limbs, pubic region, and tail white. Facial creases dark brown. Mason remarks of this species as follows:

"The barking deer is more abundant and more universally diffused than any other species. It is very appropriately named; for its cry, which is constantly heard in the jungles after nightfall, is very like the barking of a dog. It uses its horns with great effect when brought to bay, and, according to Karen fable, the tiger will not attack it. In ancient times, the story goes, when all animals had the power of speech, the tiger said to the barking deer, 'Oh barking deer, what is the use of thy horn? It seems to me they would be in my way.' The barking deer answered, 'A single push of my horns will make the eye of my antagonist start from its socket.' On hearing this, the tiger was afraid, and never after attempted to devour the barking deer."

### Family Capridæ.

NEMORÆDUS, Ham. Smith.

N. BUBALINA, Hodgson.

Colour grizzled black, clay coloured on the flanks. A black dorsal stripe. Fore-arms and thighs anteriorly reddish-brown, the rest of the limbs hoary. Below whitish.

Length 5 feet or more. Weight 200 lbs.

Western Yunan, at elevations of 6000 to 7000.

N. MILNE-EDWARDSII, David.

This species, writes Anderson, "is distinguished from *N. bubalina* by the uniform brownish-black colour of the upper parts, which tends to ferruginous on the thighs, and by the red colour of the lower parts of the legs, which are grey in *N. bubalina*."

The hill ranges of Western Yunan.

N. RUBIDA, Blyth.

Tor-tsaik.

A female shot on the grass and bamboo-covered slopes of Zwāgaben, near Maulmain, is thus described by Beavan (Proc. Zool. Soc. Lond. 1866, p. 4): "The animal was full grown, but had not had young, and was of a thick set 'porcine' build. Lacrymal sinus small, slightly developed. General colour black, with a tinge of hoary. Inside of ears white, with black tips and edges. Belly and tibiae rufous. Throat rufous, white-tipped. Intradigital pores apparently absent. False hoofs of fore and hind legs  $1\frac{3}{4}$  inch. Irides dark brown. Teats four. Buttocks rufous and white. Said by Karens to have only one young one at a time."

	feet	inches
Length, from tip of nose to tip of tail . . . . .	4	6
Tail, including end tuft of hair . . . . .		7
Height at shoulder . . . . .	2	$10\frac{1}{2}$
Girth behind forearm . . . . .	2	10
Ear, length of . . . . .		$8\frac{3}{4}$
Horns, along the curve . . . . .		6
Length of hoof . . . . .		$1\frac{7}{8}$
Extreme stretch . . . . .	6	4
Mane, stiff black bristles, erect . . . . .		6

This species appears to be distributed from Arakan through Pegu to the extremity of the Malayan Peninsula, and to occur in Siam and Formosa, and also in Sumatra. Blyth observes:—

"This species varies much in colour, from red to black, and the black sometimes with a white nape, or the hairs of the nape may be white at the base only. Two flat skins from Arakan are of a pale red-brown colour; with black dorsal list, and

quite resemble the figure of one from Formosa, which is styled *C. Swinhoei*. Mason also states that it is common on the mountains of Toung-ngoo, and Cantor obtained it from those of the Malayan Peninsula. The 'wild goat' mentioned by Crawford, as stated by the Siamese 'to be found in some of the mountains of their country, and to be shot for their horns, which are prized by the Chinese for certain alleged restorative properties,' can hardly be any other. On comparison of skulls from Sumatra, Arakan, and Mergui, I could detect no distinguishing character, and they differ little from those of *C. bubalina* of the forest region of the Himalaya, except in being considerably smaller. The genus is a very peculiar one, by no means so nearly related to the Goats and Gorals as is generally supposed, but examples of it should be studied in captivity before it can be thoroughly understood."

CAPRA, *Linnaeus*. OVIS, *Linnaeus*.

Domestic goats, Dr. Mason observes, thrive well in Burma, but the reverse is the case with sheep, and Dr. Mason records that Major Macfarquhar, who formerly owned the only sheep in the province of Tavoy, during one rainy season lost forty out of a hundred and fifty. At Maulmain they appear to do a little better, and at Thayet-myo, where there is less rain, they are said to do well. At Thayet-myo, however, the sheep are now lodged in raised houses, where they are well protected from the damp of the rainy season. Formerly many sheep were carried off by leopards, which brutes however steadily avoided entering a large trap which was set and baited for them. They were in the habit of leaping the thorn fence surrounding the fold and carrying off their prey in spite of it. A clever sergeant, however, hit on the happy thought of surrounding the trap with a high hedge of thorns similar to that round the fold. This was accordingly done, and the same night a leopard leaped over the hedge and entered the trap, which had been vainly set for him before.

Family **Bovidae**.

GAURUS, *Ham. Smith*.

Horns slightly flattened on one side. Spinous processes of the dorsal vertebrae greatly developed.

G. GAURUS, *Ham. Smith*.

The Gour. Pyoung.

Colour dark chestnut or coffee-brown. Legs below the knee white. Horns pale-greenish, tipped with black. Similar in shape in both sexes, but much more massive in the male.

Length 9 or 10 feet; tail 34 inches. Height at shoulder to 6½ feet.

The cranium of a Burmese bull, without the lower jaw, weighed 34 lbs.

In the male a hump, which is absent in the female, rises over the shoulder.

The 'Pyoung' is diffused throughout Burma, and extends as far south as Singapore, the animal reaching perhaps to a fuller development in the forests of Burma than in India.

G. SENDAICUS, *S. Müller*.

The 'Banting.' Lesser Burmese wild bull. Tsein or Sain.

Horns of the male resemble those of the 'gour,' but in the female are slender and lyrate. Colour chestnut, with white stockings. Blyth remarks that "the 'banting' has bred in the Zoological Garden of Amsterdam, where I have seen bull, cow and calf in fine condition. The bull more especially has an indication of a hump, which however must be specially looked for to be noticed, and he has a broad and massive neck like the Gaur, but no raised spinal ridge, nor has either of these species a deep dewlap like Gayah. The cow is much slighter in build, with small horns that incline backwards; and she retains her bright chestnut colour permanently, while the bulls become black as they attain maturity, excepting always the white 'stockings,' and also the white patch on each buttoek, which is characteristic of the species. In the old bull the cuticle between the bases of

the horns becomes enormously thickened, corneous and rugged, and this begins to show before the coat has commenced to change colour, as may be seen in a stuffed specimen in the British Museum, which is that of an animal procured in Pegu by the author of this paper, and which lived for some time in the London Zoological Gardens. How far to the eastward the range of this animal extends in the Indo-Chinese countries, remains to be ascertained; but I have reason to believe that two other species of *Bos* remain to be described there, one of which is domesticated in Siam and the other in Cochin-China."

G. FRONTALIS, Lambert.

The Gayal, or Mit'hun.

General colour as in the '*Gaur*,' but it possesses a dewlap, which the '*Gaur*' does not, and, unlike that animal, is easily domesticated. The wild animal inhabits the upper part of the Assam Valley and Mishni Hills, ranging thence into the borders of China. The domesticated race extends through the Tippera and Chittagong Hills, as far south as the Koldayne River in Arakan.

Mr. W. Blandford, in his interesting zoological notes (Journ. As. Soc. Bengal, 1867, Part II. p. 193), thus describes the differences outwardly visible between the Gaur and Gayal:—"The most remarkable of course are the comparatively straight and wide-spreading horns, and the enormously developed dewlap of the Gayal as contrasted with the sharply curved horns and absence of any dewlap in the Gaur and the shorter tail of the former. In the Gayals the head is shorter, and I think altogether smaller than in the Gaur, and the dorsal ridge is not quite so high. In the adult bull Gayal in Calcutta the skin of the back and sides is almost naked, as in the buffaloes of the plains of India; this I have never seen in the Gaur." As the above animal was one (procured, I fear, in a questionable manner) that had lived, if not been bred, in captivity, it will be interesting to ascertain how far this condition of the skin is natural to the animal in a wild state, or induced, as I suspect, by captivity.

BOVALUS, Hamilton Smith.

Forehead convex, rounded. Horns large in both sexes, inclined backwards and upwards, laid back horizontally when the animal is in motion. Hair scanty, black.

B. ARNI.

The wild buffalo.

The horns are either straight and long, curving at the tips only, or crescentic throughout. The former are found chiefly in Assam, and a pair has been known to exceed 12 feet, measured along the curve from tip to tip. The latter form is the handsomer and more formidable, and is seen in Burma to perfection, though single horns of that sort do not usually exceed 3 feet in length.

Dr. Mason remarks: "There are great numbers of wild buffaloes in the jungles of the south, which are supposed by the natives to be indigenous, but they are more probably of the domestic race that have run wild, like the wild horses of America." This is more or less doubtful, but Blyth instances in support of it that the Indian buffalo now abounds in a state of wildness on the north of Australia, where they have spread from Port Essington, and there are many in the delta of the Nile, where they must have descended from domestic stock. As the Burmans do not consume milk, or any of its products, the calves receive their full share and develop into noble animals, equal almost to the wild in plumpness and vigour. It is a curious sight to see a herd of these creatures tended by a boy of five or six years old, stretched at length on the back of an old bull, who seems as regardless of his burden as though a goat had settled on him, yet the child will drive and manage a herd of these creatures, with nothing but a small switch. A tiger will not attack a herd of buffaloes, as it is credibly reported that if a herd sights a tiger, it charges *en masse*, and destroys its adversary; but if separated from the herd, buffaloes are easily overpowered by a tiger. The strange sight (to them) of a European, especially if on horseback, is very likely to evoke an alarming display of hostility from these

animals; but if their keeper is with them, they are easily restrained, and a child can drive them off. Curiosity and distrust of an unknown object has quite as much to do with their behaviour, alarming though it often is, as any special dislike to a European. Horses, however, are undoubtedly distasteful to them, and a horse-man will always act wisely by giving a herd a wide berth.

Dr. Mason remarks: "There is perhaps no domesticated animal in the world concerning which learned men in Europe and America" (and Asia he might have added) "are so profoundly ignorant as the Buffalo. From misapprehensions of the character of the animal, they have very generally concluded that the unicorn of the English Scriptures was the Buffalo. Gesenius, Hengstenburg, and De Wette in Germany, render the word by 'der Buffel,' and Stuart, Robinson, and Noyes, in America, say 'Buffalo.' The oriental Buffalo, observes one, appears to be so closely allied to our common ox, that without attentive examination it might be easily mistaken for a variety of that animal." Dr. Mason was, however, far from exhausting the absurdities of authors regarding so marvellous a beast. In Webster and Wheeler's People's Dictionary one of the definitions given is a "kind of African stag," whilst in the Cyclopædia of India the following cluster of mistakes is recorded: "The buffalo inhabits *Thibet*," which is absurd, "but is *domesticated* in India," the fact being it is *indigenous in the wild state* to the grassy plains along the Ganges and Berhampootra, "the Indian Archipelago and Southern Europe. It is the *only indigenous ruminant* in Ceylon," a statement one would hardly have expected to see in a work published but ten years ago, with Kelaart's 'Prodromus' in the hands of the compiler!

#### Order CARNIVORA.

Raptorial mammals, some killing their prey, some eating carrion, and some subsisting on a mixed diet. Toes with sharp or blunt claws. Mammaræ abdominal. Clavicles wanting or rudimentary.

##### *a. Plantigrada.*

##### Family **Ursidæ.**

##### *HELARCTOS, Horsfield.*

Dentition, I.  $\frac{3}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{8}{8}$ ; M.  $\frac{4}{4}$ .

The 'sun bears' are distinguished from typical bears by their small size, short fur and rounded skulls.

##### H. MALAYANUS, Raffles.

The sun-bear. Wet-wun (Pig bear).

Cantor thus describes the *Helarctos* of the Malayan Peninsula:—"Colour of the young, snout and lips pale ferruginous. Head, back, and outside of the limbs black, mixed with pale rust colour, in consequence of many of the black hairs having the point, or a part next to the point, of the latter colour. Ears, tail, paws and inner side of the extremities shining black. The somewhat woolly hairs of the abdomen are faintly marked with ferruginous, and are mixed with longer stiff black hairs." The V-mark on the chest is described as variable. In the living animal it is of a pale rust or orange colour, in some individuals with a few small blackish spots, fading after death to a yellowish white.

The common bear of Burma is usually referred to this species, but though it may range into Tenasserim, it is doubtful if it does so into Pegu, and the correct determination of the species of bears inhabiting Burma has yet to be effected.

Blyth says this is the only bear which inhabits British Burma, but I greatly question the accuracy of this statement. I believe *Ursus Tibtanus* occurs in Pegu, and is the 'wet wun' of that province, and I certainly had at Toung-ngoo a young bear with only four upper incisors, which I can hardly suppose to be anything else than a young *Procheilus* (W.T.). Dr. Mason remarks, "On one occasion, while sleeping in a Karen field that had been recently harvested, I was disturbed all night by a drove of them digging up the roots of the sugar-cane that had been left in the



field. They will occasionally attack a man when alone. On descending the Tenasserim a few years ago on rafts, the foremost raft passed over a rapid, and made a short turn into a little cove below, when a bear from the shore made a plunge at the raft and threw the two Karens on it into the water. At this moment the other rafts came in sight, and the bear retreated. On another occasion I met with a Burman and a bear that he had just shot, and the Burman assured me that he shot the bear in the very act of running upon him; and last year a Karen of my acquaintance in Toung-ngoo was attacked by one, overcome and left by the bear for dead. Though severely bitten, the man recovered. The Kamees and Karens describe a smaller species, yellow on the breast, for which they have a distinctive name, but I imagine it is a variety of the above. The Burmese and northern Karens say there is a species with feet and hands like a man, which they call (loo-woon) man-bear. This I suspect to be a fabulous animal, founded on reports of the ourang-outang." Is it not equally probable that it may apply to the *U. Tibetanus* or *Procheilus*, and the smaller species with a distinctive name to *Helarctos*? It seems strange that the "northern Karens" only should hear of the ourang-outang.

URSUS, *Linnaeus*.

U. TIBETANUS, F. Cuv.

Two young bears which I once reared (of I believe this species) afforded me a pleasing illustration of Burmese feeling. I procured them very young, when about to proceed by boat through the delta, to Rangoon, and having no milch goat with me, and knowing the repugnance of Buddhists to supply milk, I was rather at a loss how to rear them. I soon found, however, all my difficulties smoothed over, for no sooner did I make known the wants of my tender charges to the women of the villages at which I stopped, than quite a competition ensued among them as to which of them should contribute milk for their support, the act of so doing being a work highly meritorious, in a Buddhist point of view, as contributing to save life, and more matrons' milk was delivered on board my boat than I knew what to do with, and wonderfully did the young bears thrive on it. An adult shot by myself in the Pega district measured in the flesh 6 feet and 2 inches. This was, I believe, *U. Tibetanus*, and was quite unlike the little Malayan species, *U. Malayanus* (W.T.).

PROCHEILUS, *Müller*.

Differs from other *Ursidae* by having only 4 upper incisors.

*U. LABIATUS*, Blain.

The Indian black bear.

This animal has not hitherto been recorded in Burma, but a young bear I once had in Toung-ngoo with only 4 upper incisors could hardly have belonged to any other species.

ARCTONYX, F. Cuvier.

✕

Dentition, I.  $\frac{3}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{1}{1}$ ; M.  $\frac{4}{4}$ .

Feet plantigrade, with five strong fossorial claws. Habit that of a badger, but more robust.

A. COLLARIS, F. Cuv.

Khwaë-tawet or Wet-tawet.

Colour, upper parts, with head, throat, and breast yellowish-white, more or less grizzled. Nape, a narrow band across the breast, anterior portion of abdomen and the extremities deep blackish-brown. There is also a brown band from the middle of the upper lip, gradually widening posteriorly, and including the eyes and ears, and another smaller and narrower band from the lower lip passing through the cheek and uniting with the other on the neck.

Head and body 25; tail 7 inches.

Ranges from Nipal to Bengal and Assam, and thence to Arakan and the Tsittoung Valley.

\* Remove *Arctonyx* to Page 466 under *Viverrida*.

Dr. J. Anderson, in a note to Blyth's "Mammals of Burma," p. 29, infelicitously attempts, in my opinion, to correct Dr. Jerdon, maintaining that 'Bali soor' = 'sand pig,' and not 'Bhaloo soor' = 'Bear pig,' is the animal's proper name. Dr. Anderson adds that the name 'sand pig' is "in consonance with its known habits." Does Dr. Anderson suppose it to live *on* sand, or *in* sand, because I doubt if the creature does either the one or the other, in spite of such authority for its "known habits." Its claws are so remarkably like those of a bear that I think 'bhaloo soor,' bear-pig, as likely to be correct as 'baloo sur,' sand-pig, at all events till its arenaceous proclivities are more clearly demonstrated than they have as yet been.

#### A. TAXOIDES, Blyth.

About half the size of *A. collaris*, and a coat very like that of the European badger, but softer. Muzzle less broad and hog-like than in *A. collaris*, and with proportionately smaller ears.

#### b. Digitigrada. Family **MUSTELIDÆ.**

##### LUTRA, Ray.

Dentition, I.  $\frac{3}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{3}{2}$ ; M.  $\frac{2}{2}$ .

Ears small. Feet palmate. Tail round, depressed towards the top, flat beneath. Eye provided with a nyctitating membrane.

T. NAIR, F. Cuv.

The common Indian Otter. Phyuau.

Colour hair-brown or light chestnut-brown, sometimes grizzled with hoary tips, or marked with isabelline yellow. Beneath yellowish or reddish white. Sides of head and neck, chin and throat, whitish. Head and body up to 29 inches, tail 17, and 3 inches broad at the base.

##### L. LEFTONYX, Horsfield.

Small-clawed otter.

Distinguished from the last by its small claws.

"Otters," remarks Dr. Mason, "abound in some of the streams. In the upper part of the Tenasserim, a dozen at a time may be occasionally seen on the rocks in the river. The Burmese sometimes domesticate them, when they will follow a man like a dog." This is true I believe everywhere; they are rollicking, frisky creatures, but make bad pets, as they can inflict a cruel bite, and not unfrequently do. Dr. Anderson thinks that *L. nair* does not range into Burma, but is there replaced by a species which he inclined to identify with *L. simung*, Raffles. How many species or what species they are which occur in Burma is not thoroughly known, and to this end it is essential that the skull in each instance should accompany the dried skins.

##### MARTES, Linnaus.

Allied to the weasels (*Mustela*), but with an additional upper premolar, and a tubercle on the inner side of the carnassier.

##### M. FLAVIGULA, Bodd.

Colour, head, face, and upper parts of body and limbs glossy blackish-brown, the chin and lower lip white; throat and breast yellow, from pale to yellowish-orange. Colours vary considerably.

Head and body 20; tail 12 inches, with hair.

This is a wide-spread species in India, and in the Himalayas ranges up to 11,000 feet or more. It ranges into Arakan and Malayana, the Malayan race being paler-coloured than the Indian one, and with shorter fur.

##### HELICIS, Gray.

Dentition, I.  $\frac{3}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{4}{2}$ ; M.  $\frac{2}{2}$ .

The upper carnassier three-lobed, with a wide two-pointed inner process.

*H. NIPALENSIS.*

The Nipal wolverine. Kyouk pyan or Kyoung-pyun.

Above earthy brown. Below with the edge of the upper lip and insides of the limbs and terminal half of the tail yellowish. A white vertebral stripe from the nape to the loins. Forehead with a white band confluent over the cheeks with the pale under surface.

Head and body 16; tail (with hair) 9 inches.

Ranges from Nipal through Arakan to Pegu, south of which it is probably replaced by the allied (if not identical) species.

*H. Orientalis*, Horsf.

The Hebrew word, Dr. Mason remarks, rendered “*weasel*” in Leviticus, is identical with the Arabic ‘*Khalad*,’ which signifies a mole.

*H. MOSCHATA*, Gray.

The colour is paler than in *H. Nipalensis*, the hair on the thighs and fore-arms being white-tipped.

Inhabits Yunnan at 5000.

Dr. Anderson considers that the three Indian species, *H. Orientalis*, *H. Nipalensis*, and *H. moschata*, are separable from each other by three different types of skull; the first distinguished by its shortness, large teeth, short palate and a small infra-orbital foramen; the second by its greater length, large teeth, long palate, and small infra-orbital foramen; and the third by its long skull and palate, small teeth and large infra-orbital foramen.

Family **Canidæ.**

Cox, Hodgson.

Dentition, I.  $\frac{3}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{3}{2}$ ; M.  $\frac{4}{4}$  = 10.

General structure as in *Canis*, but with only 12 molars and premolars in either jaw, the second tubercular premolar of the lower jaw being wanting. Mammæ 14.

*C. RUTILANS*, Müll.

Wild dog. Tor-khwē.

Colour bright rusty red or rufous fawn colour, paler beneath. Tail moderately ‘brushed,’ reaching to the heels, and usually black-tipped.

Distributed in suitable localities over the whole of India, Ceylon and Burma, Sumatra, etc., but from its retiring habits is rarely seen.

An ‘Indian wild dog’ is described by Dr. Murie (Proc. Zool. Soc. L. 1872, p. 715), which I believe represents an animal from Burma; anyhow there can be little question, from the consensus of opinion of those who have studied the animals alive, that there is but one Asiatic species, though Gray (P. Z. Soc. L. 1868, p. 498) separates into as many species the Nipal, Southern Indian and Sumatran wild dogs (*C. primæus*, *C. Sumatrensis* and *C. Dekkanensis*).

Dr. Mason remarks, “There is a wild dog in the Provinces which Mr. Blyth regards as a distinct species, and the Karens have described to me an animal that makes his kennel in the ground like a fox or a jackal, which they say is found in the Shan country. The ‘fox’ of the English Bible is probably the ‘jackal.’ The Hebrew word is ‘*shugal*,’ the Persian name of the jackal is ‘*shughal*’ and ‘*shakal*,’ and the Pali is ‘*thugala*’ and ‘*shugala*,’ from the same root which the Burman books render ‘earth-dog.’” The wild dog, according to Hodgson and Jerdon, preys by night and by day, but chiefly by day. Six, eight or ten unite to hunt down their victim, maintaining the chase rather by scent than sight. In hunting, they bark like hounds, but in discordant tones, alike differing from those of the domesticated dog, or the jackal and fox. Of some kept in confinement, Hodgson remarks that “after ten months’ confinement they were as wild and shy as at the first hour I got them. Their eyes emitted a strong light in the dark, and their bodies had the peculiar fetid odour of the fox and jackal in all its rankness.”

The wild dog is said to kill even tigers, though this is improbable, but Dr. Jerdon once came on a tame cow buffalo which had been killed by them; but 'sambur' and smaller game, including pigs, are their more usual prey.

*CANIS, Linnaeus.*

*C. AUREUS, L.*

Dentition, I.  $\frac{a}{6}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{a}{8}$ ; M.  $\frac{a}{8}$  = 42.

The Jackal. *Myae-khwē.*

Colour rufous grey, the hairs mottled black-grey and brown. Tail reddish-brown, with a dark terminal tuft. Individually the colour varies greatly, there being specimens in the Calcutta Museum pure white, coal black, and bright rufous or chestnut (Blyth, J.A.S.B. 1858, p. 275).

Ranges into Arakan as far south as the Naf River. In Burma it has been shot about Prome, and Thayet-myo, but neither Mr. Blyth nor Dr. Mason would seem to have met with it further south. I have myself seen it near Maulmain, but the doubt exists if the pair I saw may not have been descended from specimens imported for hunting purposes by some sporting members of the European community. This is, however, unlikely, and Dr. Mason alludes to the existence of an animal which makes its "kennel in the ground, like a fox or a jackal," in the "Shan country" (upper Salween Valley?), which may very likely be this animal.

### Family **Viverridæ.**

*VIVERRA, Linnaeus.*

Dentition, I.  $\frac{a}{6}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{a}{8}$ ; M.  $\frac{a}{4}$ .

A large anal pouch, which secretes an odorous substance called 'civet.' Pupil vertical and oblong. An erectile mane along the back. Thumbs not remote. Does not climb trees well.

*V. ZIBETHA, L.*

The grey civet cat, Khyoung-myen, or 'horse-cat,' of the Burmese, from its mane.

Colour yellowish or hoary-grey, with black spots and stripes. Throat white, banded with black. Tail with six black rings. Limbs black or sooty. Mane distinct. Sometimes the spotted markings are faint or obsolete.

\*Length of head and body 33 to 36 inches. Tail 13 to 20 inches (with hair). This animal produces the odorous secretion called 'civet' from a large subcaudal gland  $2\frac{1}{2}$  inches in diameter. The animal is sometimes kept caged, and the odorous secretion scraped out of its receptacle from time to time, for use by perfumers. Mason says this animal is not so abundant in Burma as *Viverricula*.

*V. MEGASPILA, Blyth (J.A.S.B. 1862, p. 331).*

*V. tangalunga, Cantor.*

The large spotted civet-cat.

Resembles *V. zibetha* in size, but the body-markings and spots large and black. Blyth remarks, "I have seen flat skins of this animal from Prome resembling those which Dr. Cantor procured in Province Wellesley, and one brought from Sumatra by Sir Stamford Raffles. It is nearly allied to *V. civettina*, of S. Malabar, but very different from *V. tangalunga*, Gray, of the Malay countries, which is a much smaller animal, with more cat-like tail, and the spots of which are much smaller and more numerous."

Dr. Günther gives the length of an adult from Penang (Proc. Zool. Soc. 1876, pl. xxxvii. p. 427). Body and head, 36.0; tail 17.0 inches; total 4 feet 5 inches.

Ranges from Prome to Penang.

*VIVERRICULA, Hodgson.*

Form longer than in *Viverra*. Thumbs remote. Climbs well. Anal pouch as in *Viverra*.

## V. MALACENSIS, Gmel.

The common civet-cat. Kyoung-ka-do.

Tawny grey or greyish-brown, with several longitudinal lines on the back and croup. The sides longitudinally spotted, sides of the neck with some transverse bands. Belly unspotted. Head darker, with a black stripe from the ear to the shoulder. Tail long, with eight or nine dark annular rings.

Length of head and body 22 to 23 inches; tail 16 to 17 inches.

Common in Burma and the Malay countries.

Mason remarks, speaking of this species, "The Indian civet-cats secrete an odoriferous substance identical with '*civet*,' though not the '*civet*' of commerce. This species is not infrequently found in the villages, and its secretion enters into the Burmese *Materia medica*."

## PROTOXONOTUS, Horsfield.

Dentition, I.  $\frac{2}{2}$ ; C.  $\frac{2}{2}$ ; P.  $\frac{3}{3}$ ; M.  $\frac{3}{3}$ .

Body slender. Limbs short. Claws retractile. Tail very long. Five toes on all feet. Thumbs approximate. Soles well furred. No anal pouch. Mammariae two pectoral, two inguinal.

## P. PARDICOLOR, Horsf.

Colour orange-buff or fulvous, spotted with black. Four irregular lines down the neck, and seven longitudinal rows of squarish or elliptic spots, each row consisting transversely of eight spots, diminishing in size from the dorsal line. Below entirely unspotted. Tail with eight or nine annuli.

Head and body 16; tail 14 inches.

Ranges from Nipal to the Kakhien Hills, where Anderson procured a skin.

## P. MACCLOSUS, W. Blanford.

"Upper part brownish-black, broken up by greyish-white bands, lower parts white, tail brownish-black, with 7 white rings, tip whitish. Two broad black bands run down each side of the upper part of the neck, between them is a narrow greyish white band, with a faint mesial dark streak, somewhat interrupted, and passing into two bands of elongate spots between the shoulders. The two broad dark bands pass into the dark patches of the back; on each side of these bands is a white rather wavy stripe, commencing at the ear and continued along the neck, above the shoulder, and down the side to the thighs, becoming more irregular behind; below this again is a dark band somewhat broken up into spots in front, passing over the shoulder, and continued as a line of large spots along the side. The back is chiefly brownish black, crossed by six narrow transverse whitish bands, the first five equidistant, the foremost communicating with the mesial-neck band, and the hinder all uniting with the white band on the side, so as to break up the dark colour into large spots. There are small black spots on the fore neck, lower portion of the sides, and outside of the limbs, the spots on the fore neck forming an imperfect gorget. The white rings on the tail are not much more than half the breadth of the dark rings; the last dark ring, near the tip, and the first white ring, are narrower than the others. Nose dark brown mixed with grey, a dark ring round each orbit, with a streak running back to below the ear, and another passing up to the crown; forehead between and behind the eyes, and in front of the ears, and cheeks, pale grey. Ears rounded and clad with blackish hairs outside, and near the margin inside, a few long pale hairs on the inner surface of the ear-conch. Whiskers long, extending to behind the ears, the upper brown, the lower entirely white. Soles, except the pads, which are naked, covered with fine hair."

Head and body 18.25; tail 16.75 = 35 inches.

Ranges through Martaban and Tenasserim.

"This species," Mr. Blanford remarks, "appears well distinguished from *P. gracilis* and *P. pardicolor* by its larger size, and by the much greater prevalence of dark colour on the upper surface generally. In external characters *P. maculosus* is nearer to the Malay species, *P. gracilis*, the Himalayan *P. pardicolor* having the upper parts covered with comparatively small spots, and more numerous rings on the tail. With

*P. gracilis* I am only acquainted by description and figures. Judging by these, the principal difference in the colouration is, that in *P. gracilis* the pale tint prevails very much more than in *P. maculosus*, the upper parts of the former being marked by irregularly-shaped blackish spots on a pale ground, whereas the upper surface of the latter is dark, with a few white streaks dividing the colour into patches. On the tail of *P. gracilis* the dark rings are represented as narrower, and, towards the tip, much narrower than the white rings, and there is a long white tip. In *P. maculosus* the dark tail rings are nearly twice as broad as the light, and the white tail tip is very short, shorter than the last dark ring. The distribution of colour on the head also appears different, the whole nasal region in front of the eyes being dark in *P. maculosus*, but not in the figure of *P. gracilis*. The more important dimensions of *P. gracilis* as given by Horsfield are: length of the body from the extremity of the nose to the root of the tail 1 ft. 3½ in.; length of tail 1 ft. ½ in."

PARADOXURUS, *F. Cuvier*.

Five toes on all feet, connected by a web. Claws semiretractile. Pupil elliptic, vertical. In some species a glandular fold exists near the anus, which secretes a peculiar substance, devoid of the odour of 'civet,' but no distinct odoriferous pouch. Diet mixed. Climbs well.

*P. GRAYI*, Bennet.

*P. Nipalensis*, Hodg.

Colour above light unspotted fulvous brown, in some lights ashy, beneath paler. Limbs ashy, darker towards the feet, which are black. Tail same colour as body, the end dark, white-tipped. Ears and face black. Forehead, nose-streak, and subocular band, whitish.

Length of head and body 30; tail 20 inches.

Ranges as far south as the Arakan Hills.

A specimen described by Hodgson in Nipal was very cleanly in its habits, and devoid of unpleasant smell; but when irritated, was capable of producing a shocking stench, by the discharge of a thin yellow fluid from two pairs of pores situated on each side of the anus. It preferred boiled rice and fruit to flesh, offered to it, but preferred to anything, birds if captured by itself, in which it was wonderfully expert, darting on them, from its feigned sleep in a corner, with unerring aim.

The 'carnassier' tooth of this species is shorter than in other *Paradoxurus*, and it has been ranged by some as a *Paguma*.

*P. MUSANGA*, *F. Cuv.*

The common Paradoxure. Khyoung-wôn-baik.

Colour brownish-black, with some dingy yellowish lateral stripes, sometimes obsolete. The forehead sometimes white-banded, and a white spot above and below each eye, and usually a black median nasal streak. The colour, however, is subject to much variation. The tail is yellowish-white towards its termination. Belly sometimes marked with elongated white spots.

Occasionally the tail is spirally distorted, so that the underside, towards its tip, is uppermost, and on an individual peculiarity of this sort the generic name of '*Paradoxurus*' or '*screw-tail*' was based, according to Blyth.

Length of head and body 22 to 25; tail 19.5 to 21 inches.

Common in Burma, the Andaman Islands, the Malay countries, India, and Ceylon.

*P. TRIVIGATUS*, Tem.

The three-striped Paradoxure. Khyoung-na-gā.

Colour grey, with three dark streaks. Fur soft and silky.

Head and body 26.5; tail 27 inches.

"This animal is very common, and occasionally enters houses in the town in pursuit of rats. When young, it is easily domesticated, and valuable as a ratcatcher."

Ranges into Tenasserim from the Malay countries, and has been shot by myself in the Arakan Hills near Nioung-ben jo on the Sandoway Road.

*P. PERCOTIS*, Blyth.

*P. Tytleri*, Tytler.

The white-eared Paradoxure. Khyoung-na-zwet-hpyu.

Fur dense and woolly at base, with long hairs intermixed. The prevailing colour is fulvous brown, with three blackish dorsal streaks; below paler, more or less albescent. A white streak on the nose between the eyes. Ears black at the base, with the terminal half flesh-coloured and scantily clad with white hairs. Paws and terminal half of tail blackish.

Head and body 18; tail 18 inches; total 3 feet.

Arakan to Tenasserim (J.A.S.B. 1858, p. 274).

*ARCTICTIS*, *Timminck*.

Canines stout, lower ones very long, compressed at the base, and grooved externally. Body long. Legs short. Tail long and prehensile. Toes five on all feet. Claws strong, curved and semiretractile. An anal gland secreting an oily fluid of an intense but not fetid odour.

*A. BINTURONG*.

The Binturong or monkey-tiger. Myouk-kyā.

Colour black throughout, with a white border to the ears, with a ferruginous wash sometimes, or grizzled and hoary. Head, face, throat, and base of tail whitish or hoary. Tail excessively thick at the base, and tapering to a point.

Head and body 28 to 33 inches; tail 26 to 27 inches.

Ranges from the Malay countries into Assam.

"This animal was first discovered in Malacca. In its habits," says Dr. Cantor, "it is both arboreal and terrestrial and nocturnal, sleeping till the sun is below the horizon, when it displays great agility in searching for small quadrupeds, birds, fishes, earth-worms, insects, and fruit. The howl is loud, resembling some of the Malayan Paradoxuri. It is remarkable, says Mr. Blyth, for being the only placental mammal of the old world which is furnished with a truly prehensile tail."

### Family **Herpestidæ.**

*URVA*, *Hodgson*.

Structure intermediate between *Gulo* and *Herpestes*. Mammar, six, ventral.

*U. CANCHIVORA*, Hodg.

The crab mongoose. Mwai-bā.

Colour fulvous iron-grey, variable. Inner fur woolly, outer of long lax hair of mixed black, white, and fulvous. Belly brown, limbs blackish-brown. A white stripe from the ear to the shoulder. Tail rufous or brown, with rufous tip. Body elongate.

Head and body 18; tail 11 inches. Weight 4 pounds.

Ranges from Nipal to Tenasserim, and is said by Blyth to be the only mongoose found in Burma.

According to Hodgson, this animal is somewhat aquatic in its habits, feeding much on frogs and crabs (*Thelphusidæ*).

*HERPESTES*, *Illiger*.

Dentition, I.  $\frac{2}{2}$ ; C.  $\frac{2}{2}$ ; P.M.  $\frac{2}{2}$ ; M.  $\frac{4}{4}$ .

Five toes on all feet, with semiretractile claws. Ears small, rounded. Eye small. Muzzle pointed. Mammar four. Anal pouch or glands present, but no fetid secretion. Habits active, diurnal, bold and sanguinary.

*H. MALACCENSIS*, F. Cuv.

The Bengal mongoose.

Colour rich reddish-brown, mixed with hoary yellow, redder on the ears, face, and limbs. Hair harsh, diffuse and not closely applied.

Head and body 15; tail 10 or 11 inches.

Jerdon says this species ranges through Assam, Burma and the Malay countries, though Blyth would seem never to have received specimens.

*H. AUROPUNCTATUS*, Hodg.

Colour olive-brown, with a golden tint due to the yellow annulation of the fur. The sides are paler, and the under parts dirty yellowish-white.

Length—Head and body 12·70; tail 10·25=22·95 inches.

Inhabits Bengal and ranges to the Punjab on one hand, and Assam, Upper Burma (Blamo), and Malayan Peninsula on the other.

### Family **Felidæ.**

Dentition, I.  $\frac{3}{2}$ ; C.  $\frac{3}{2}$ ; P.M.  $\frac{4}{1}$ ; M.  $\frac{2}{1}$ .

FELIS, *Linnaeus.*

Five toes before, four behind. Claws retractile. Habits nocturnal. Some species are easily domesticated, though somewhat uncertain and dangerous playmates, being all of them highly sanguinary, and the most perfect type of raptorial carnivora.

*F. tigris*, L.

The Tiger. *Kyā.*

Colour bright fawn, more or less rufous in hue, with dark stripes. The average size (says Jerdon) of a full-grown male tiger is from 9 to 9½ feet in length; but occasionally one may reach to a few inches over 10 feet. These measurements, of course, are taken over the body, as the skin, after it is removed, may be stretched a foot or two more.

Tigers, as a rule, kill their own prey; but rather than die of starvation, they will condescend to carrion. Jerdon relates a case of a tigress and two cubs devouring a buffalo which had died of disease, and the still more remarkable fact of a tiger removing the body of a tigress which had been shot, before the pad elephant, which had been sent to bring in her body, arrived, and devouring half of the body. This was related by a celebrated sportsman in Khandeish, and was probably the result of the starving condition of the animal. Dr. Mason remarks, "No animal seems to be more universally diffused than the Royal Tiger. While other animals vary in species over a large extent of country, the tiger seems the same from the Indus to the Menam, and from Malacca to the Himalayas. In travelling we come on their tracks ever and anon, but till tigers have by some peradventure tasted human blood, they do not appear to attack man, but confine themselves to his dogs, hogs, goats or ponies. They do not habitually come within a fence, but a fence is no obstacle to a hungry tiger. I stopped one evening in the school-house of a large Bghai village, which was surrounded by a high bamboo fence, with no entry into the inclosure but by a small gateway. I had a stout Shan pony with me, tied up under the room (all houses in Burma being raised five or six feet from the ground) where I was sitting and writing, about eight o'clock in the evening. Suddenly there was an agonizing snort from the pony, followed by a loud crash of the fence close by, and nothing more was heard. In the morning the half-eaten body of the pony was found at the foot of the hill half a mile distant. It is noteworthy that at the time the tiger carried off the pony, my cook was boiling the kettle for tea just outside the gateway, not more than two or three yards from the entrance, where the tiger must have passed in." Dr. Mason goes on to add that this tiger was wounded and probably killed the next night by a gun set with a spring close to the carcass of the pony. "It is sometimes said a tiger will not attack an elephant; but one of our Karen Christians, engaged in the timber-trade in 1871, turned his elephant out to feed at evening near the foot of the mountain on which Bangalay stands, and he found it next morning mortally wounded by a tiger. Its back and rump were dreadfully bitten up, and it was supposed that the tiger had come upon it, while laid down and asleep, for tigers do not often attack elephants." In explanation of the above remarkable case, it may be suggested that



the elephant was weakly and sick, as elephants in health do not lie down, but sleep standing. A case may here be quoted illustrating the risk of going near a recent 'kill.' A friend of mine, Mr. Montgomery, when surveying in Arakan, was surprised one morning to find a fine dish of pork chops on his breakfast table. On inquiry he found that his people had found a pig just killed by a tiger near the village, and had appropriated the meat to their own use. After breakfast my friend strolled out to see the spot, a Burman leading the way, and several men bringing up the rear of the party. They had barely reached the spot, when the exasperated and hungry tiger, with a terrible roar, flung himself into their midst. The Burman, who was leading, was thrown down, and died in a few hours of his injuries, whilst my friend had his leg torn open from the hip to the knee, seemingly by the hind claws of the tiger, and was for weeks laid up and incapable of walking. The tiger, satisfied with the vengeance he had inflicted, disappeared, and was not seen again. Alluding to the ravages of tigers in India, Dr. Mason remarks: "The difference however, it is believed, is not in the tigers, but in the men. Whenever a man-eating tiger turns up among the Karens, they set traps, and nooses, and pitfalls, and spring spears, and give him no rest until he is caught one way or other. Then his captors take his body, slung on bamboos, to exhibit him in all the surrounding villages, and every village contributes whatever they choose, to remunerate the party which has delivered them from so dangerous a neighbour, which in the aggregate often amounts to a handsome sum, and this keeps up the stimulus to hunt down such nuisances whenever they appear. When natives are travelling in small parties, they often extemporize a bamboo staging among the branches of a tree, on which to spend the night, but they are no security from the attacks of tigers. I have heard of a Karen being carried off whilst asleep among the upper branches of a tree by a tiger which had stealthily crawled up the trunk. I was formerly incredulous of the native reports of tigers running up trees, but quite recently the thing occurred in the presence of a party of Europeans." Unfortunately the quotation on which Dr. Mason relies gives neither names nor dates, so that it is possible that leopards, not tigers, were the animals; neither is it certain that the witnesses were sportsmen, who are not in the habit of confounding the two animals. I believe the consensus of opinion among sportsmen is that tigers do not ascend trees. On the Arakan Coast, where tigers are numerous, I have often noticed what seemed a most inadequate protection from these animals, but which I was assured was really not so. A number of strips of bamboo, some three feet long, stuck into the ground, each bent into a semicircle, overlapped by the adjoining ones, much as a flower pot is surrounded in an English garden. A puppy could jump over the circle thus formed, but I was assured no tiger would attempt to do so. I can only suppose that the tigers suspect the arrangement to be connected with some spring spear, or other contrivance, which their experience has led them to dread.

After mentioning several cases of both Karens and Burmans being killed by tigers, Dr. Mason adds, "These few facts, which might easily be multiplied, have been mentioned because the opinion has gone abroad that Burmese tigers are not dangerous. Dr. Hoffer wrote, 'They are of quite a different nature from those in Bengal, and probably more afraid of men, than men of them. Accidents very seldom happen to natives who penetrate daily into untrodden jungle, sometimes quite alone.' Such representations may prove fatal to strangers and persons new in the country, as they already have in the case of Dr. Woodford, who lost his life by a tiger on the Ataran a few years ago, wholly owing to his want of suitable precaution in going away from the boat near evening to shoot a peacock." The circumstances of this case help to explain the immunity with which people traverse the haunts of these animals. The tiger is nocturnal in his habits, and having been on the prowl all night, and probably fully satisfied his appetite, is during the day very indisposed to move, or to interfere with either man or beast passing near his lair. Towards sunset, however, the case is different, and the risk vastly increased, but men do not usually move about the jungles during the night. Tigers in Burma vary greatly in size, and the Burmans recognize a large and a small race. The large race is regarded as inoffensive to man as a rule, but the small tiger is much more dreaded.

F. PARBUS, L.

The leopard. *Thyt-kyā*.

Colour rufous fawn, variable in shade, with black spots grouped in rosettes. Tail more or less ringed. Belly whitish. Leopards vary greatly in size, and it is not certain if two species are not included under the same name. Length from 6 to 8 feet, and their habit and proportions seem to vary even more than their extreme length. There are probably several local races, but Jerdon merely separates two, the *Panther*, a large animal with a longer skull in proportion than the other, and the *Leopard*, with a shorter head proportionally, and longer fur. "Leopards," Dr. Mason remarks, "are probably more numerous than tigers, and they will sometimes attack man, though he seek refuge in the tree tops. Two Karens were travelling on one occasion in the forests of Maulmain, and when daylight departed, they made little bamboo platforms to sleep on during the night, in the branches of a large tree, one on a lower main branch, and the other on an upper large branch. During the night, the man on the lower branch was awaked by what he thought to be a tiger, but it must have been a leopard creeping up the body of the tree above him. It had passed his branch, and was climbing up to where the other slept. He called out: the man answered, and the leopard was still, not a claw moved; but the sleepy man could not rouse himself, and in a few minutes the leopard rushed up, seized the man in his sleep, and jumping down with him, devoured him at the foot of the tree, regardless of all the noise the narrator of the story could make in the tree above him.

"While the inhabitants of a Bghai village were gathered round my *zayat* (the guest house, which nearly every village in Burma possesses) one night, to preserve it from a jungle fire raging around, loud screams were heard from a few women left in the house close by, and it appeared that a leopard, taking advantage of the absence of the inmates, had come under the house, and endeavoured to effect an entrance through a hole in the floor.

"Black leopards, commonly called black tigers, are frequently met with in Tavoy province. They are dangerous beasts. A few years ago, a Burman was devoured by one, not eight miles distant from Tavoy city."

F. DIARDI, Desmoulins.

*F. macroclis*, Tem.

The clouded tiger-eat.

Ground colour pale greenish-brown or clay-brown, changing to tawny on the lower parts and inside the limbs, or sometimes whitish below. A double line of small cateniform spots, from the ears, diverging on the nape to make room for a smaller inner series. Large clouded spots, dark edged, and crowded together on the back and sides, and some irregular spots on the sides and belly. Throat black-banded. Tail dark ringed.

Head and body 42·0; tail 36 inches = 6½ feet, but it grows larger.

Ranges from the Himalaya through Burma to the Malayan Peninsula.

F. VIVERRINA, Bennett.

The fishing tiger-eat.

Colour mouse-grey, sometimes tinged with tawny, with large dark spots, oblong on the back and neck, but in lines more or less rounded elsewhere. Cheeks white, with a dark face stripe. Five or six dark bands on chest. Belly spotted. Tail dark-banded, and black-tipped.

Head and body 30 to 34; tail 10·5 to 12·5 inches. Weight 17lbs.

Jerdon remarks that the ears are small and blunt; the pupil circular. This last observation would indicate diurnal habits, unless it refers to an animal killed at night with expanded pupil, when of course no contraction would result. The nasal bones are narrow, giving a viverrine appearance to the face, whence its specific name. Blyth says this is a tameable species, but that a newly-caught male killed a tame young leopardess of twice his own size.

*F. UNDATA*, Desmarest.

Thyt-khyoung, Arakan. The leopard-cat.

Colour and markings variable. Ground colour from fulvous grey to bright tawny-yellow, rarely greenish-ash or brownish-grey. Lower parts white. Four spots on the forehead, and behind them two lines to the root of the tail, with a broader one on either side in front of the shoulders. Back and sides longitudinally spotted. Two narrow lines above the upper lip. A transverse band on the throat, and the tail spotted, and ringed towards the tip.

Head and body 24 to 26; tail 11 or 12 inches.

This is a very savage species, and quite untamable, according to both Blyth and Jerdon. It appears to take to the water readily.

*F. ACUTATA*, Tem.

*F. Moormensis*, Hodg.

*F. Tenamircii*, Vigors (young).

Colour above deep bay-red, paler beneath and on the sides. Throat sometimes indistinctly spotted. Ears internally, and tip of tail black.

Head and body 31; tail 19 inches.

Blyth does not include this species in his list of Burmese mammals, but Dr. Mason writes: "There is an animal of the tiger tribe called the 'fire-tiger,' from the colour of its skin, which is of an uniform red." Dr. Mason was inclined to refer it to *F. Chaus*, but the '*Chaus*' is not red. A caged specimen I once saw in Maulmain was a uniform red, and unapproachably savage.

*F. MARMORATA*, Martin.

The marbled tiger-cat.

Colour dingy fulvous or yellowish-grey, with numerous wavy black spots, clouded or marbled. Some blackish lines on the head and nape, coalescing into a dorsal interrupted band. Thighs, sides, and tail black-spotted. Tail tip black. Belly yellowish-white.

Head and body 18½ to 23; tail 14 to 15½ inches.

This species is not included by Blyth in his list of Burmese mammals, but Jerdon says it is found in the hilly regions of "Assam, Burma, and Malayana, extending into the Island of Java, at all events."

*F. CHAUS*, Guldenstadt.

The common wild cat.

Colour yellowish-grey, dark and unspotted, inclining to rufous on the sides of the neck and belly. Below white. A dark stripe from eye to muzzle. Ears slightly tufted, rufous black externally, white within. Limbs with two or three dark stripes. Tail annulated with black.

Head and body 26; tail 9 or 10 inches.

Inhabits India, ranging into Arakan, though how far south is not clearly ascertained. Dr. Mason does not seem to have met with this species in Tenasserim, though it not improbably occurs in the Irrawaddy Valley.

A curious habit may here be noticed which all 'tom' cats have of discharging their urine backwards, and to a considerable height. This may be noticed in the case of domestic cats, who sometimes salute our walls and furniture after this fashion. I was once myself standing in front of the tiger's cage at Barackpore, in company with some ladies, when, on a sudden, the beast turned round and discharged a powerful jet of urine between the bars, which passed between the shoulders, luckily, of two of the party, and it was the merest accident that one of them did not receive the same in her face. I mention this circumstance, to put others on their guard against a similar accident happening to them.

## Order PRIMATES.

## Sub-order LEMURIA.

## Family Nycticebidæ.

## NYCTICEBUS, Geoffroy.

*N. TARDIGRADUS*, F. Cuv.

The monkey's concubine. Myouk-moung-mā.

Head round, with short muzzle. Ear short and hairy. Tail short. Eyes large, approximate. Colour dark ashy grey, paler below, with a dark vertebral streak. Ears and space round the eyes dark.

The slow loris, Dr. Mason remarks, is not abundant in Burma, and "the Karens say that were it to enter a town, that town would assuredly be destroyed."

## Sub-order CHIROPODA.

## Tribe CATARRHINI.

Dr. Mason thus prefaces his early account of the monkeys of Burma: "The *Quadrumana*," says Agassiz (deservedly deemed the greatest of living zoologists), 'are limited on all the continents to the warmest regions, and but rarely penetrate into the temperate zone. This is a natural consequence of the distribution of the Palms, for these trees, which constitute the ruling feature of the flora of the tropics, furnish, to a great extent, the food of the monkeys.' There are more than half a dozen of the *quadrumana*, or monkey tribe, in this country, and it will be new to European naturalists to learn that they draw a very small portion of their sustenance from the Palms. The 'Gibbons' eat the fruit of the '*ficus*,' which genus probably furnishes more fruit in this country than all the palms together. The flowers of the 'cotton trees' (*Bombax*), whose fleshy calices afford much nutriment, the large flowers of the '*Dillenia*,' and many others, are much sought by the white-eyed monkeys, while the monkeys on the streams, besides shell-fish and crabs, eat the tender shoots of reeds and bamboos. All the species eat wild plantains, which are very abundant."

## Family Hylobatidæ.

Tailless arboreal apes or Gibbons.

## HYLOBATES.

*H. HOOLOCK*, Harlan.

The white-browed gibbon. Myouk hlwai-kyau (generic).

Colour varies from sullied white, or fulvescent, to black. A broad white frontal band.

Ranges from the Brahmaputra to the Irrawaddy.

*H. LAR*, L.

The white-handed gibbon.

Colour much as in *H. hoolock*, but the hands and feet are invariably white, and the face is encircled with white.

Inhabits the Tenasserim Provinces and Siam.

Blyth remarks: "Both the white-browed and the white-handed gibbons vary exceedingly in shade of hue, from black to sullied white and pale fulvescent; the two sexes equally of *H. lar*, but the females only, so far as I have seen, of *H. hoolock*. The males of the latter would appear to be constantly black, the females rarely so, at least in Assam, though according to Colonel Tickell both sexes of it are always black in Arakan. A pale specimen from Sandoway has nevertheless been recorded. Whatever the rest of the colouring may be, *H. hoolock* has constantly a broad white frontal band either continuous or divided in the middle; while *H. lar* has invariably white hands and feet, less brightly so, in some, and a white ring, encircling the visage,

which is seldom incomplete. Some of both species are variegated or parti-coloured; and the pale examples of *H. lar* constitute the supposed *H. entelloides*. Whether the two anywhere inhabit the same forests, and what the limits of the range of either of them may be, has yet to be ascertained, but the habits which Tickell and I have detailed may be considered to have generic application."

Dr. Mason remarks of this species: "The first sounds that usher in the morning in the Karen mountain glens in the Tenasserim provinces, are the wailing cries of the gibbons on the hill-sides around. The whole of the interior is alive with them, and their habit of screaming as the day dawns is celebrated in Karen poetry." Their cry is:



The sounds varying from the deep notes of the adults to the sharp treble of the young ones.

Mr. Blyth remarks, "It is not generally understood that the long-armed apes are true bipeds, when on the ground, applying the sole flatly, with the pollux widely separated from the other digits; the hands are held up to be out of the way, rather than for balancing, but they are ever ready to seize hold of any object by which the animal can assist itself along, even as a human being commonly grasps a banister, when ascending a staircase. Upon the forest trees, however, the Gibbons swing themselves about or forward by means of their upper limbs only, with extreme facility and grace, and at a marvellous rate of speed, when duly exerting themselves, taking the most astounding hand-leaps in rapid and continuous succession when in full career." They are gentle creatures in confinement, especially the females; but it is cruel to deprive them of liberty, as the change of food and habits and their enforced inactivity is generally fatal to them. One I kept was something like a fractious child, when ill. It would sometimes seize my hand, carry it to its mouth, and very gently close its teeth on one of my fingers, with an action and expression, which said as plainly as words could, "I should like to give you a good bite if I only dared."

### Family Papionidæ.

Baboons.

Monkeys with simple stomachs and cheek pouches.

*MACACUS, Desmarest.*

*M. ARCTOIDES*, Geoff.

*M. speciosus*, F. Cuv.

*M. brunneus*, Anderson (young).

The stumpy-tailed monkey.

This monkey is readily known by its tail, which is thus described by Anderson: "In life the tail is rarely carried erect, and is, as a rule, applied over the anus, its latter fourth being doubled upon itself to the left, and serving to fill up the interspace between the upper divergent portion of the callosities, so that the animal sits on this portion of its tail, the upper surface of which is rough and somewhat callous. The latter fourth of the tail contains the hook-like process formed by the last caudal vertebrae, but they are restricted to its base, the remainder of the organ being tough and tendinous and destitute of vertebral elements. Here then is an instance of a monkey sitting on its tail, and there is the more importance to be attached to this observation, because the habit appears to be a peculiarity of the species. Associated with this habit we find a tail, with its latter fourth bent upon itself, and applied

between the callosities, and its upper surface roughened by being sat upon, and moreover we find, when we come to examine its structure, that this bent portion contains only a few rudiments of vertebrae at its base, its greater extent being reduced to a tendinous mass. These facts seem to have only one explanation: This tail from its short size is in the monkey's way when it sits down, and frequently becomes placed under the animal while it is in this attitude, and from the circumstance that it does not extend beyond the ischial tuberosities, it seems as if the tail had been originally bent round by the will of the animal into the interspace between the callosities, to escape being pressed between them and the ground; that in time the curvature became permanent, fitting in of itself when the organ happens to be sat upon. These facts might support Lord Monboddo's theory of the gradual disappearance of tails."

From comparison of various specimens, Dr. Anderson has established the fact that these red-faced stumpy-tailed monkeys "are born with a purely uniform brown fur," but as age advances the hairs become annulated, and in the adult "the characteristic feature of the fur is the regularity and uniformity of the annulation, and the great number of annuli which occur on each individual hair," ranging as high as 14.

This monkey ranges from the Kakhyen Hills to Assam, appearing to be restricted to the hills, and not to be found in the more open ground. It has been sent by Phayre from Arakan (Proc. As. Soc. B. June, 1847). It also occurs in Tenasserim, having been procured near Malwōn by Mr. Alfred Mough, when stationed in that neighbourhood, and that gentleman observed that the same name (Myouk-lwai-gyan) was given to it by the natives as to the Gibbon, probably from the shortness of its tail, leading them to regard it as a sort of terrestrial gibbon or ape.

*M. NEMESTRINUS*, L.

The pig-tailed Baboon of Pennant. Myouk-pa-htie.

General colour olive, tending to brown, the variation being due, according to Dr. Anderson, "to the relative development of the yellow and black rings on the hair. The rings occur on the exposed portion of the hair, the hidden part of which is grey." Head and back often very dark. The under part, greyish, together with the sides of the face, which are marked with blackish-grey. The face is nude, and with the ears and callosities, of a dusky flesh colour. "The tail is a little more than a third of the length of the body and head, and is rather sparsely clad, contracting somewhat rapidly to a point, and carried erect, being somewhat downwardly curved near the tip."

Inhabits Borneo and Sumatra, and ranges south of Tenasserim.

A curious habit may be noticed in those monkeys with gaudily-coloured posteriors and adjoining parts, of thrusting that part of their persons into your face, as it were, by way of welcome or conciliatory salutation. This may be seen in the common Rhesus monkey. Let a dog, or a man whom the monkey distrusts, approach, and the monkey presents a bold front, with a threatening display of its teeth. Let, however, a friend approach, or any one whom the monkey wishes to conciliate by civility, and it immediately turns round and elevates its rubicund posteriors to the gaze of the visitor, with a reverted look over its shoulder, which plainly says, "There, are you not charmed with that beautiful vision?" This charmingly naïve habit is only practised by those monkeys whose 'sacral' callosities and adjoining parts are gaudily coloured, and is not noticed in individuals belonging to other families not so provided.

*M. LEONINUS*, Blyth.

*M. Andamanensis*, Bartlett.

The long-haired pig-tailed monkey. Myouk-ni.

The long-haired pig-tail monkey was originally described from two skins, without skull or other bones attached, from Arakan. One was that of a particularly fine male, with hair on the fore-quarters from four to five inches long, and the tail-tuft of a deep ferruginous colour, which also tinged the fore-quarters. The other was that of a small young animal, rather pale in colour. It does not appear to be a common species, ranging from the North of Arakan to an undetermined distance southward, and, according to Dr. Mason (MS.), to Toung-ngoo. In the Malayan Peninsula, it is

replaced by the nearly allied *I. nemestrinus*, the well-known short-haired pig-tail monkey of the Malay countries, which is a likely species to inhabit also the southern Tenasserim provinces. Both of them are highly docile, and the manifold performances of "Jenny," the so-called Andaman monkey, that lived for some time in the London Zoological Gardens, will be remembered by very many visitors. In Sumatra the short-haired species is commonly trained to gather cocoa-nuts.

Male, from muzzle to tail 23; tail 8=31 inches.

Ranges from Arakan to the Irawaddy Valley.

Speaking of the tail of this species, Dr. Anderson remarks: "The caudal vertebrae have all the appearance, so to speak, of degradation, and look as if they were in the process of becoming reduced to the rudimentary character which they assume in the stumpy-tailed monkeys."

*M. cynomolgus*, L.

The crab-eating monkey. Myonk-ta-ngā.

*M. carbonarius*, F. Cuv.

*M. aureus*, Is. Geoff.

The various races of this monkey vary considerably in colour. In Burma they are generally devoid of any yellowish tinge, the face blackish in the living animal, with strongly contrasting white eyelids, and no trace of crest on the vertex. The Malayan race is much less dark about the face, and the upper parts are yellowish. The individual variety of this monkey, of an orange colour, *M. aureus*, has been sent from Mergui, by Maj. Berdmore, but there is no established race so coloured. Dr. Mason observes: "This monkey is more numerous in individuals than any other species in the Provinces. It abounds on the sea-shore, and on the banks of inland streams, especially on tide-waters, where it appears to draw a large portion of its sustenance from crabs and shell-fish found on the banks. Hence the Burmans have named it the 'Fisher Monkey,' and when the tide is out a whole troop is often seen issuing from the jungle to conchologize. Some are observed turning over stones in diligent search of shell-fish, others breaking up the shells they have found to get at the animals within, but most seem to be in search of small crabs, and wherever the trace of one appears, a monkey will thrust down his arm up to the shoulder, if necessary, to draw it out of its hole. Fruits, however, are as acceptable to them as shell-fish. On one occasion, coming down close in-shore at the mouth of the Tenasserim, a troop of them followed my boat for a considerable distance, being attracted by the plantains that we threw, which they picked up and ate with great avidity."

Inhabits Burma, south of Akyab. In S. India and Ceylon this species is replaced by *M. radiatus*, and *M. pileatus* respectively.

Dr. Anderson has pointed out that the character of a dark or a livid colour pervading the face, hands, callosities, and the presence or absence of a pale supercilium, is not of specific value, being variable, and subject to complete gradation, and he has accordingly united the *M. carbonarius*, and its golden variety, *M. aureus*, with the Linnean species. The leading features of this animal, Dr. Anderson remarks, are "its massive form, its large head closely set on the shoulders, its stout and rather short legs, its slender loins and heavy buttocks, its tail thick at the base, and its very full and prominent scrotum," which is brownish, blotched with livid blue.

*M. ASSAMENSIS*, MacClelland.

A female of this species obtained below Bhamo is thus described by Anderson, Colour "uniformly brown, with a rufous golden tinge over the shoulders and neck, the latter tint paling on the head, more especially over the external angle of the forehead. It is pale yellowish behind the ears and on the back part of the cheeks, where there are a few intermixed black hairs. There are a few black supraorbital hairs, and the ears are tufted with hairs of a similar colour, besides being well clad internally. The face is surrounded from behind the ears to the chin by long pale yellowish hairs, and the beard as well developed, the hair having a well-defined almost black subapical band. The limbs externally, and the upper surface of the feet, are concolorous with the hinder quarters of the animal. The under surface of the

body and limbs is of a pale yellowish. The tail is dark brown at the base, paling somewhat towards the tip, which is slightly tufted. The face and ears are dusky." This species, Dr. Anderson also remarks, "differs from all adult examples of the common monkey of the plains of India (*M. rhesus*) which have come under my observation, in the anterior half of the body, wanting the ashy tint, which is so characteristic of the adults, and in the hinder portion of the body being in no way rufous."

This monkey is found in troops along the Irrawaddy below Blamo.

M. RHECUS, Audebert.

Above brownish-ochrey or rufous. Limbs and beneath ashy brown. Sacral callosities and adjoining parts red, seasonally very brilliant. Face of adult males also red. Length of head and body 22; tail 11 inches.

This is the common 'bandar' or red monkey of all India, and ranges according to Anderson into Hotha and Momien.

The brutal and degrading resemblance to man of this animal has always been the subject of wonder and disgust to the pride and sensibilities of all anti-Darwinians. No greater ignominy could the poet heap on the miserable Eutropius, than when, in those scathing lines, he likens him to this animal—

"Humani qualis simulator simius oris  
Quem puer arridens, pretioso stamine Serum  
Velavit, nudasque nates et terga reliquit.  
Ludibrium mensis, erecto pectore dives  
Ambulat et claro, sese deformat amictu."

(Claudian, In. Entr. Lib. I. 303).<sup>1</sup>

But the most curious point about these 'odorous' comparisons (as Mr. Malaprop would say), lies in the fact that the Anthropoid Apes would seem to be more disgusted with their poor relations than man himself, and I have myself noticed the intense annoyance and anger displayed by an adolescent female of the Asiatic '*Orangutan*' at the presence of a Rhesus monkey. There was an unmistakable desire on her part to claim kinship with and recognition by man, and a laughable repudiation by her of her humble relative the monkey, and there could be no question that the degrading similarity of feature displayed by the Rhesus was more offensive and intolerable to the ape than even to man. This remark seems to bear on the truthfulness to nature of Shakespeare, even in such a triviality as Caliban's dislike for these animals, where he says,

"We shall lose our time and all be turned to Barnacles or to apes  
With foreheads villainous low."

A descent in the scale of nature, if slight, yet not the less dreadful in Caliban's eyes. The ape here meant is no doubt a *Rhesus* monkey, and not one of the Anthropoid apes, as would be generally understood by the term now.

#### Family Colabidæ.

SEMNOTITHECUS, F. Cuvier.

Long-tailed monkeys with sacculated stomachs and no cheek-pouches.

S. BARBEL, Blyth.

Colour dark fuliginous, with a silvery grey wash over the head, back, and sides. Hands, feet, and eyebrows black. Face bluish-black.

Head and body 19·5; tail 29 inches.

Inhabits the Tippera Hills, the Kakhyen Hills, and the Irrawaddy Valley above Mandalay.

<sup>1</sup> So looks that mimic of the human form  
An ape, whom boys with silken robes adorn  
And round the banquet lead; he stalks sedate  
The jest of all who view his borrowed state,  
While the rich vestments on his shoulders borne  
Leave bare his buttocks, to the gazer's scorn.



*S. PILFATUS*, Blyth.

Colour dark ash grey, passing into black at the extremity of the tail. The whiskers before the ears long and divergent, and continued down the sides of the cheeks to the chin, forming a short but distinct ruff. Throat, chest, and part of the belly bright yellow, paling to yellowish on the remaining under parts.

This species represents *S. Entellus* of Bengal, in Burma, and ranges from Assam through Tippera to the valley of the Irrawaddy, and as far south as Tenasserim.

*S. obscurus*, Reid.

The dusky-leaf monkey. Myouk-hnyo.

Colour ash or brownish-black, darkest on the face, sides, and shoulders. Hands and feet deep black, under parts paler coloured. "This animal," Blyth remarks, "is the most common species of the genus in the Malayan Peninsula, from which its range extends at least to the province of Mergui, where it was obtained by the late Major Berdmore. It has also been received from Siam, and is likewise an inhabitant of Sumatra, if not also of Borneo. The adults are blackish, with hair upon the nape lengthened and conspicuously whitish. The newly born young are of a vivid golden-ferruginous colour, which soon changes to dusky-ash, and is continued latest upon the tail."

*S. CHRYOGASTER*, Lich.

"The mature animal has the upper parts, limbs, and tail blackish, the hairs ferruginous on the basal half; a slight band crossing the forehead, cheeks, front, throat, and front of neck, sullied white; rest of the lower parts deep and bright ferruginous, which tinges the inner side of the limbs; face colourless, or pinkish white. Young wholly pale ferruginous, somewhat darker on the hands and feet. There is a slight compressed crest on the vertex, but no distinct whisker-tufts, or lengthened hair on the nape" (Blyth).

This species was procured in Tenasserim, by Helfer.

*S. CRISTATUS*, Rafll.*P. Phayrei*, Blyth.

The silvery-leaf monkey. Myouk-myek-gwen-lpyu.

Colour silvery dark ash, whitish below. Crested vertex and long whisker-tufts, which conceal the ears, in front. Face leaden black, except the mouth and lips, which are pinkish.

Inhabits Arakan, Tenasserim, Sumatra, Borneo.

Sub-order *BIMANA*.Homo, *Linnaeus*.

## II. ANDAMANENSIS.

The Mincopie.

Of all the various races living within the dominions of the Empress of India, there are none more calling for study than the race or races inhabiting the Andaman Islands, of one of which races, however, we may be said to know nothing beyond the bare fact of its presence in North and Middle Andamans, though the adjoining island has been occupied by us as a penal settlement for over a quarter of a century. Kurz made a powerful appeal, in the interests of science, for a thorough botanical survey of the Andaman group, and zoologically the islands are no less interesting than they are botanically; but the apathy of the English Government in promoting research of a purely scientific character is too ingrained to be overcome by any isolated appeal, and the islands are themselves too little known and too out of the way to fall within the sphere of private enterprise. Mr. A. O. Hume gives a few details of the inhabitants in *Sray Feathers* (vol. ii. p. 66), when describing his interesting cruise to the Andamans and Nicobars, accompanied by Stoliczka, Wood-Mason and Ball, who figure throughout under the respective characters 'Philosopher,' 'Crustacean' or

'Invertebrate,' and 'Geologist,' and a right jolly and interesting time of it they seem to have had. The following extract will give a general idea of the geographical relations of the group inhabited by these blameless Anteliones. "These islands have never yet been very accurately surveyed, indeed the chief materials for the chart for the Nicobars are derived from the very partial surveys executed by the Novara expedition, but the distances below are approximately correct. From Cape Negrais to Preparis 85 miles; Preparis to Great Cocos 50 miles; Great Cocos to the northernmost point of the Great Andaman 15 miles. Total length of the Great Andaman 135 miles. Macpherson's Straits divide the latter from Rutland Island, which is 10 miles in length. Then comes a blank of 80 miles before we reach Car Nicobar, the northernmost of this group. Tillangehong and Teressa, which are about 40 miles apart, are each distant some 60 miles from Car Nicobar, and from this latter Camorta harbour, which lies in the middle of the four central islands, Nancowry, Camorta, Katchall, and Trinkutt, is distant about 90 miles. From Katchall to the Little Nicobar is about 35 miles. The Little and Great Nicobar together are some 50 miles in length, and between 60 and 70 miles south-east of the latter, we come to Pulo Way, one of the small islands lying off Acheen Head, the north-westerly point of Sumatra." Viewed on the map, therefore, these islands form an irregular band, connecting Cape Negrais, the southern termination of the Arakan range, with Sumatra, and this deduction is doubtless true; but an examination of the Fauna of these islands indicates that such connexion must have been a remote one, "since not only are almost all the most characteristic species of the Arakan Hills, as we now find them, absent from these islands, but these latter exhibit a great number of distinct and peculiar forms, constituting, where the ornis is concerned, if we except the cosmopolitan waders and swimmers, considerably more than one-third of the whole number known."

An examination of the Flora of the islands would seem to support more strongly than their ornis, their recent connexion with the mainland of Burma, for Kurz, in referring to the subject, writes (*l.c.* p. 33): "In accordance with these indications we find the bulk of the Andamanese Flora to be Burmese, while not a few purely Malayan species find their northern limits in the Andamans. Among these Malayan forms may be mentioned *Dracontomelum*, *Irina*, *Peltophorum*, *Ternstræmie Penangiana*, *Cycas Rhumphii*, *Lindsæ daralliioides*, *Ptychosperma Kuhlîi*, *Ryparia*, etc. Several of these extend also to Tenasserim, a province which must be considered as having a similar extension of the Malay Flora. The Flora of the Andamans is not related to that of Hindostan and India proper, a circumstance which can be partly explained by the insular climate and difference in soil. *Dalbergia emarginata*, Roxb., which has been identified with *D. latifolia* (the black wood of the west coast), occurs in the Andamans, according to Roxburgh, and, if so, it is the only example of a purely Indian tree found in the island." In seeking a solution for the apparently more highly differentiated condition of the Andaman ornis, than the Andaman flora, it seems not improbable that a smaller amount of variation satisfies a zoologist, who is searching for new species, than a botanist; or else that animals more rapidly accommodate themselves to surrounding conditions than plants. Be this as it may, the Flora clearly supports the former connexion of the islands and the mainland, which is suggested by their physical disposition and arrangement. The climate of the Andamans is thus sketched by Mr. H. F. Blanford (*l.c.* p. 31): "The temperature of the Andamans, as might be expected in the case of tropical islands, is very uniform; the coolest month (January) has a mean temperature of 78°·9; the warmest month (April) one of 83°·9, a difference of only 4°. The highest and lowest temperatures recorded during the six years 1868-73 were 96° and 67° respectively, and the absolute range during the period has therefore not exceeded 29°. In most months of the year the average daily range is from 8° to 10°."

This mild climate doubtless renders it possible for the inhabitants to exist in the state of absolute nature and nudity that they do; but taken in connexion with the high rate of infant mortality, it shows the privations to which they are exposed. For example, if any trust can be placed in the slender data available, it would seem as if the rate of infant mortality under three years along the coast of Burma bore an

intimate relation to latitude, or in other words to the amount of range of daily temperature; a minimum mortality ruling at Mergui and stations in Southern Tenasserim, bearing a strong climatal correspondence with the Andamans, but a rate rivalling the appalling one prevalent in northern climes being reached at such stations as Akyab and Chittagong, where the range of temperature is considerable, while at the same time custom and the ignorance of the people causes them to neglect protecting their young children by sufficient clothing from the inclemency and chills of the morning air.

Returning, however, to the graphic description of the coast by Mr. Hume, the following extract will give an idea of what yachting is in these seas. "The South Andaman, which we thus coasted for some 14 miles, presented throughout the same characters, a ridge of rocks or reef, on which the surf was breaking lustily, glittering and sparkling in the bright sun, little strips of the whitest possible coral beaches, fringed and bounded by dense mangrove belts composed of trees of many species, those nearest the water low and of the brightest emerald green, those behind more lofty and of a bluer tinge, all backed up by the magnificent evergreen forest trees rising tier above tier to the summits of the low ridge of hills (from six to eight hundred feet in elevation) that run down the whole way near the coast. . . . Nothing could exceed the beauty of the scene. The straits vary from a quarter to nearly a mile in width, the water still as in some little mountain tarn, clear as crystal, here green, there blue, of an intensity known only in the tropics, everywhere paved with coral reefs and plateaux clustered with marvellously coloured sponges, zoophytes and corallines, and haunted by innumerable shoals of still more brilliantly tinted fish; it was like looking down into a garden of another world to that in which my work-day life had passed. On either side, rising from the very bosom of the water, the mangroves stretched a broad unbroken emerald zone around the base of the hills, which overlook, in places almost overhang, the straits throughout, and on the southern shores on Rutland Island rise to an elevation of 2000 feet. Magnificent forests clothe these hills. Huge trees, amongst which the *Mimusops indica* and *Hemicyclia andamanica* are conspicuous, rise tier above tier in a luxuriance nowhere to be surpassed; the foliage is of the most varying tints everywhere, and is relieved by tall straight stems, looking like slender silver columns, supporting a multitudinous-storied hanging garden. In places enormous creepers hang in gigantic garlands and festoons from tree to tree, an almost unbroken wreath down half a hill-side. . . . We anchored for the night in mid-channel; a soft cool air sprung up, and we were soon enjoying a repast such as only native servants can concoct, *ad fresco*, at half an hour's notice, with none of the means and appliances which the humblest cook in the West deems indispensable. Within five minutes of our anchoring, some of the convict crew had lines and a little net out, and in another five minutes they had pulled out a couple of large buckets full of miraculously coloured fish, things which, had I merely seen them in paintings, I should have pronounced Turneresque dreams of piscine impossibilities; such shapes, such colours, above all such incredible combinations of colours. They were mostly, I think, what are called rock cods (*Serranus*), of half a dozen different species, orange, magenta, crimson, blue, green, black, buffy, one bright colour spotted with another. . . . There were numbers of other species, but I will not try and describe them. I have not the requisite knowledge, and the majority of my readers who had not seen alive the fish that haunt the coral reefs, would fail to realize or even credit their unearthly beauty. Alas! that ichthyologists have yet to invent a process of preserving unchanged the "hues of paradise" that adorn them. The last thing I heard was our 'Geologist' enjoining silence on our 'Invertebrate.' 'Peace,' he said in a low sweet voice, 'I would fain be in the land of Nod, where Crustaceans cease from troubling, and even Stick-insects are at rest.'"

Not long after this they fell in with two large canoes full of Andamanese of the Rutland Island tribe, consisting of the chief, his wife and a number of followers, who are thus described: "They were little, square-built, very powerfully made folks, stark naked, only the ladies wore, instead of the traditional fig-leaf, a single small, narrow, linear lanceolate leaf, fixed by a thread, which descended from a ring of

heads worn round the waist. Climbing up on to the deck of the barge, these leaves got naturally a good deal displaced, some turned on one side, some cocked right up, but this put the ladies in no way out of countenance, and with easy grace, they readjusted them (just as one sees other ladies in society adjust their dorsal protuberances on rising) patting them from side to side, till they had assumed that perfectly vertical position so essential, at any rate if anything was to be veiled from public gaze. Be it however understood that in reality these poor naked monkey-men and women are virtuous to a degree: such a thing as unchastity is absolutely unheard of, and despite their utter nakedness, despite their repulsive ugliness, these women really looked and impressed one with a sense that they are modest." It is not, I presume, the intention of the writer in the above passage, so creditable alike to himself and his humble friends, to claim for them an absolute morality, in its highest sense, as understood among ourselves, but merely to testify to the utter absence among them of systematic or venal profligacy, that fungoid growth with which our own civilization is riddled. Another pleasing trait in these children of nature is their affection for one another. This is noticed by Mr. Ball (*Jungle Life in India*, p. 211), who declares that when a shindy takes place among them, with a free use of bows and arrows, a "man on either side being struck was the signal for a cessation of hostilities." Physically the indigene would seem therefore to be well formed, and, both mentally and corporeally, appreciably above the lowest races, such as the Fuegians. Their colour is black, when the true colour of their skin is revealed by assiduous washing, and the hair grows in woolly tufts, as in other Negrito races. The following extract from a paper by G. E. Dobson, Esq., in the *Journal of the Anthropological Institute*, gives the views held by Mr. Wallace and M. de Quatrefages of their racial affinities, which seem to exhaust all that can at present be said on the question. These conclusions, briefly stated, are:

"I. That their position on an island to which nothing attracted strangers has resulted in the preservation of a very great, if not absolute, purity of blood, so that the Mincopies of the Andamans may be taken as the type of the race to which they belong."

"II. That they belong to an original negro stock, of which the Negritos may be considered one of the branches, and the Mincopies a branchlet of the latter."

"III. That the Mincopic branchlet is found on the Andamans, Nicobars, and in the Philippines, and is still represented on the continent in the Samangs of Malacca and most probably primitively occupied all or part of India."

"IV. That the Mincopic branchlet has furnished the negro element of a portion at least of the Dravidian peoples. Further, to judge from characters afforded from the examination of skulls, some pariahs (of India) are almost pure Mincopies."

"It is impossible to account for the presence of the wild tribes of Southern India, among which the dwellers in trees certainly occupy a lower place in the scale of civilization than even the Andamanese, or of the peculiar Samangs of the interior of the Malay Peninsula, surrounded by races, with which they have no connexion whatever, except on the hypothesis that they are the few surviving descendants of a woolly-haired people, which in ages past occupied lands south of the Himalayas, when the continent of Asia included within its southern limits the Andamans, Nicobars, Sumatra, Java, Borneo, and the Philippine Islands, and that the present inhabitants of the Andamans, and the Negritos of the Philippines, are also the remnants of those ancient Negrito inhabitants of Southern Asia, which have almost disappeared before the invading Aryan and Mongolian races."

"The Negritos most probably belong to the very same original stock as the African Negroes, occupying at a very distant period a great continent in the Indian Ocean, the 'Lemuria' of Dr. Schater, which seems to have once extended from Africa or Madagascar to the Malay Archipelago. At that period the southern coast of Asia was probably formed by the Himalayas, and the high lands of the peninsula of India were islands in the Indian Ocean inhabited by people belonging to the same race as that occupying the great continent southward of them, and whose descendants are still found in the homes of their forefathers. Though this great equatorial continent has almost wholly disappeared beneath the waters of the Indian Ocean, the animals

which once inhabited it are represented by some surviving descendants, which, though long and widely separated in countries once forming its extreme limits, still preserve most of the characters of their ancestors."

An interesting account of the manners of the Andamanese is given by Surgeon Day, in the *Proceedings of the Asiatic Society of Bengal*, 1879, p. 153, wherein they are described as irritable, but not vindictive, acute in their perceptions, and gifted with good memories. They practise what is called 'Tattooing,' but which is rather scarring the bodies with gashes the third of an inch deep, as their skins are too black to be capable of displaying the patterns impressed in the ordinary fashion by pointed instruments, as among the New Zealanders, the Burmese, and ourselves. The hair, which naturally grows in early woolly tufts, is closely shaved off their heads, with the exception of a narrow strip, from the crown to the nape, which is, however, kept cut very close, and this custom is regarded by Dr. Day as adopted to avoid annoyance from insects, a supposition the more probable from the habit which also obtains of plastering the skin with clay or red ochre. Formerly chips of chert were used in place of knives, but now chips of bottles are used, with greatly increased comfort and efficiency, in shaving and other surgical operations. The hardships with which they have to contend in the struggle for existence, would seem to result in a shortening of the life of the adult members of the community, and a terribly high death rate among the children, few women being able to boast of a family of more than three living children. This does not in any degree seem to depend on harshness or neglect, as both men and women are described as being fond of their offspring, and infanticide is as little known among them as prostitution, but we as yet hardly know the normal number of births among females of this race.

Their burial ceremonies are peculiar. The corpse of Jacko, chief of the North tribe, is described as having been buried in a half-sitting attitude, facing the rising sun, each mourner gently blowing in the face of the corpse as a last farewell. The grave was shallow, being covered by not more than six inches of earth, but this was deemed sufficient where no large carnivora exist to disturb the remains. "Four months subsequently, the nearest of kin went to the place of sepulture, and brought away the lower jaw, which about that time had become divested of flesh, a month afterwards the shoulder bones and a rib were extracted, and after six months the skull, now freed from impurities. This was hung round the neck of the principal mourner, and subsequently every one had it in turn to carry about."

The burial ceremonies vary somewhat, but an essential point seems to be the disinterment of the bones by members of the family, with the object, it would seem, of conciliating, by this attention, the spirit of the dead. Dr. Day adds, "When I was at Port Mout, the Rutland chief was in mourning for his only child, and was daubed all over with olive-coloured earth (a process which is repeated daily), whilst a rather thick coating of mud covered his head. This mourning lasts for one month. During periods of deep sorrow they are very silent, entirely refraining from the use of red paint, and other decorations, from taking much food, even from eating their favourite pork, whilst honey must not pass their lips, but instead they have to throw honeycomb, if obtainable, into the fire. As soon as the period of mourning has expired, they wash off the olive-coloured earth and revert to their red paint."

According to Mr. Humfray the aborigines never touch flesh, or even vegetables, uncooked, and cannibalism is entirely unknown among them, which may be, perhaps, attributed to the supply of pork which the wild pigs afford them, for it is quite an open question if the introduction of pigs into New Zealand had not quite as much to do with the speedy extinction of cannibalism there, as the dissemination of an exotic religion.<sup>1</sup>

The ordinary habitations used by the aborigines hardly deserve the name, being composed of a few sticks tied at the top and lightly thatched round with leaves and branches. On Little Andaman, however, beehive-shaped huts are met with, according to Capt. Duncan, resembling those on Car Nicobar, only larger, and not raised

<sup>1</sup> The question is clearly one eminently adapted for investigation by some learned member of the Victoria Institute.

on posts. An interesting account of the 'Kjökkenmöddings' of the islands has been given by Stoliczka (*Proceedings As. Soc. Bengal*, 1870, p. 13). The bulk of the materials consisted, of course, of such shells as are now common on the coast, save that a species of 'cock-comb oyster' appears to have been formerly more abundant than now, and the common oyster, so prized by ourselves, appears to have been as little esteemed formerly as it is by the living Andamanese. Perhaps the difficulty of detaching the large oyster, without the aid of iron implements, may account for the paucity of its valves, though oysters of any sort appear to be little relished among them, possibly from not being susceptible of as much chewing and mastication as a tough old limpet or cartilaginous chiton.

The long bones of the Andaman wild pig were pretty common, split as usual for the marrow, but no human bones were observed, and among numbers of chipped stone fragments a celt was found by M. Roepstorff "undistinguishable from any of the European or Indian celts of the so-called Neolithic period." The celts found and a fine arrow-head were all fashioned of a tertiary sandstone.

The only fragments of pottery found in these heaps were portions of rude cups, hand-made, and sun-dried only, and not baked, with rude lines on them both inside and out, made apparently with the obtuse point of a shell or stone.

In addition to the above-described friendly tribes of Rutland Island, South Andaman and the southern half of Middle Andaman, there are other tribes, or perhaps a distinct race, on Interview Island, North Andaman, and the northern extremity of Middle Andaman, of whom we know nothing, beyond their determined hostility to all strangers. "The Andamanese," says Hume (*l.c.* p. 67), "call them savages, cannot understand them, and are much afraid of them. Little has been seen of them. A party of them not long ago pounced upon a party of convicts working in the jungle, tied them up, and stript them of everything, but did not hurt them; on the contrary, after stripping them, hugged them, cried over them, patted them affectionately, and took their departure. These are probably the aborigines, and are similar to the jungle race, the Ourang-utan of the Nicobarese, who inhabit the dense forests of the mountainous interior of the great Nicobar. Then on the Little Andaman we have a distinct people, whom our Port Blair and Rutland Island Andamanese cannot in the smallest degree understand. Very unreclaimed savages whom it has hitherto been found impossible to conciliate in any way, and who murder all strangers the instant they can. They are not, however, cannibals, as has been asserted; the bodies of shipwrecked persons, and others killed by them, have always been found intact, lightly buried in the sand." What a mine of ethnological research do not these words suggest, within a day's steam of thriving English ports, and but little removed from the direct highway between India and China!

## APPENDIX A.

---

### MARCO POLO AND POLAR BEARS (Page xi).

A CURIOUS instance of the confusion which sometimes results from the incorrect identification of an animal mentioned by an old author, occurs in the supposed allusion to Polar bears by Marco Polo, whereon Baron Nordenskiöld (in his interesting Voyage of the Vega) bases the curious deduction that the Polar bear was known to and hunted by the subjects of Kaidu, governor and subsequently independent ruler of Turkestan. The passage alluded to occurs in Book iii. chapter xlv. (Marsden's translation in Boln's Antiquarian Library), and runs thus: "In these Northern districts are found bears of a white colour and of prodigious size, being for the most part about 20 spans in length. There are foxes also whose furs are entirely black, *wild asses* in great numbers, and certain small animals named 'rondes,' which have most delicate furs, and by our people are called Zibelines or sables."

The first step towards the complete mystification of the meaning of Marco Polo seems to have been in the translation of the Italian 'palmo' by the word 'span,' which may be supposed the equivalent for 10 inches; though in a note, Marsden remarks that palmo is by some rendered 'a foot.' On this supposition of 'palmo' being a span, the bears in question would measure 16 feet 6 inches in length. Marsden, in the note above referred to, introduces the term 'Polar bears,' with the remark that they grow to 13 feet in length. Following this false scent, Baron Nordenskiöld attempts to meet the palpable inconsistency of *wild asses* being found in association with Polar bears, by the ingenious, but wholly hypothetical emendation of Marco Polo's text, by substituting "reindeer" for wild asses. Baron Nordenskiöld, however, uses the term 'hand' in place of 'spans' for 'palmo,' and in this he is undoubtedly correct, as, on the supposition that the palmo, or hand, is 4 inches, Marco Polo's 'white bears' would measure 6 feet 8 inches, which is what *Ursus Isabellinus* does commonly measure. The '*white bear*,' so called, of Turkestan is, of course, *not* the Polar bear, nor is it strictly speaking a *white* bear, but the yellow bear of the higher Himalayas, and not usually found much away from their vicinity. The '*wild asses*' of Marco Polo are, of course, the Kiangs or *Equus hemionus*, an animal specially characteristic of the Tibetan plateau, and the suggestion that the 'reindeer' was the animal alluded to is an untenable hypothesis. Baron Nordenskiöld's words are as follows: "Marco Polo also says, in his account of the country of the peace-loving nomad Tartar tribes living in the north, that there are to be found there white bears, most of them twenty hands long, large black foxes, wild asses (reindeer), and a little animal called 'rondes,' from which we get the sable fur. As the Polar bear is only to be found on the coast of the Arctic Ocean, these statements prove that in the thirteenth century the northernmost parts of Asia were inhabited or at least visited by hunters" (Voyage of the Vega, Leslie's translation, vol. i. p. 141).

## NĀT-MEE, OR THE SPIRIT-FIRE (Page 6).

In connexion with the discharge of marsh gas which takes place in so many spots in Pegu, the following account of the 'Spirit-Fire' is abridged from a description of that phenomenon by Lieut. A. Duff, Deputy Commissioner of Thayet-myo, in the Journal of the Asiatic Society of Bengal, No. 3, of 1861, page 309.

I had (writes Lieut. Duff) frequently heard vague rumours of a burning hill in the Kāmā township, but believed that if such a thing had really any existence, it was situated in the Arakan hills, and was probably a volcano, similar to that near Kyouk-hpyu. In a recent tour with a friend down the valley of the Punni stream, at the village of Pun, where we bivouacked, a number of cultivators from neighbouring villages dropped in for a chat, and I overheard some villagers from Nat-mee say, in reply to a question, "Yes, it is still burning." I asked what was referred to, and was informed that it was the Spirit-Fire, whence the village derives its name, and the fire issued from a heap of stones; it was also stated that it was not always visible, but that the pilgrim had only to deposit some light inflammable substance, and make a genuflection towards the spot, saying at the same time, 'Oh great Lord! manifest thyself to me thy slave,' when the spirit would instantly send fire out of the stones and burn up the substance deposited.

Naturally some little scepticism is felt regarding so remarkable a manifestation, but a visit is arranged, and on arriving at a belt of jungle, the party has to dismount and walk to a little hillock up which they are led.

"On the top of this hillock is a large heap of stones, and going round to the opposite side of it from that we had approached by, we see the Spirit-Fire. Yes, there it is. Out of the stones in two or three places comes a bright flame, flickering and burning; at a little distance from the heap of stones, where there are some cracks in the ground, more flame. In this instance the marvel has proved true. There is nothing in the appearance of the hillock itself, or the heap of stones, differing from any other hillock, or any other heap of stones in this part of the country; no appearance of boiling lava, violent upheavals, or any of those convulsions with which one is accustomed to associate the idea of subterranean fire. The ground and the stones were not even hot, except in the places where the fire was actually burning; the soil was gravelly, and at one place where the flame was issuing from a crack, I stirred up the gravel with a stick. The effect produced I can only compare to that produced by stirring up a plum pudding in which brandy is burning. The flame spread itself and flickered about the gravel just as the burning brandy does about the pudding, but just as in that case the pudding is not burnt, so in this, the gravel did not become extremely hot, and could be handled, though some of the stones in places where the fire came steadily were all but red hot. Query, What was the substitute for brandy in this case? There was at times a slight simmering noise, but not so loud as that of a boiling kettle." After this the writer adds what is the actual truth of the matter. "The conclusion we came to regarding the phenomenon was that it was some inflammable gas issuing from the earth."

The following translation is also given of the Burmese legend connected with the manifestation. "Long, long ago, there lived in the village now called Nat-Mee, a man who gained his living as a blacksmith. When his time was come, he died, and became a Nat; but still he loved his old home and hankered after his old occupation; so he established the Spirit-Fire on a hill near the village, and there continued his old trade; hence the village came to be called Nat-Mee. Whenever a villager wanted a *dha*, or an axe, or a spade, he took the iron to the fire, and depositing it there, said, 'Oh, my Lord, make this iron into a *dha*,' or an axe, etc., as the case might be, and returning for it next day, he would find his iron fashioned into the article he wanted, whether *dha*, axe or spade, but no man ever saw the spirit at his labour.

"At last, one day, a man of the Khyen race brought a *dha*, and depositing it by the fire with a piece of iron, said, 'Oh, my Lord! weld me on an edge to this *dha*,' and went his way. Now the Khyen was a man of a curious disposition; so next morning he got up very early, and climbing the hill, hid himself in the jungle near



the fire. When it got light, he peeped out, and saw the spirit in the form of a man, wearing a red *putso*, and a red turban, working at the *dha*. So the Khyen called out, 'Oh, my Lord! have you not finished my *dha* yet? Let me have it quickly, I pray you.' But the Nat being enraged at being discovered at his labours by a prying Khyen, took the *dha* out of the fire, red hot as it was, and casting it at him, hit him on the cheek; and the Khyen in great fear fled from the spot; and so great was his fear, that he never stopped to examine his wound, nor ever felt it, till he had run about a *dein*<sup>1</sup> and a half; and then he stopped a little, and rubbed his cheek with his hand, whence that spot was called *Pa-Bawot* (*cheek rub*), and is so called to this day. But the Khyen was too terrified to stop, so he ran on for about a mile further, and there sitting down, was seized with a violent fit of trembling, hence that spot was called *Thoon* (*Tremble*) even unto this day. And when the trembling was over, the Khyen got up, and though his fear urged him to fly, the fatigue he had undergone and the pain of his wound rendered his steps slow and uncertain; but he struggled on for about a *dein* further, and then he was obliged to stop; and the blister on his cheek burst, and his cheek swelled up and became one great sore, and he was unable to move for many days: so he remained in that place, and hence it was called *Pouk-Pou-Gia* (*burst-hot-swollen*).

"After this the Nat never again would labour for the villagers: but still his fire burns near his old home, and once in every year every fire in the village is extinguished and rekindled from the Spirit-Fire; for there is an old tradition handed down from time immemorial, that whosoever of the villagers neglects this tribute of respect to the Spirit of the Fire, his house and all that he has will inevitably perish in flames ere a year goes by."

The above myth is not only curious, but offers some valuable materials for reflection. It is often objected, to those who would challenge the historical claim of similar legends, that the authors of them must have been very dishonest people to invent mere fables and palm them off as history, and that, as there are strong grounds of presumption that the early recorders of these myths were not dishonest men, *therefore* the myths are historically true. But we are too apt to forget an inherent propensity of the human mind to self-deception, whereby the floating records of marvellous events, originating no one knows how or where, come to assume an historical consistency, and it is only to a few logical minds that the task is not only ungrateful, but to a certain extent painful, of relinquishing any tradition of the past whereon they have been wont to rely.

Now the most philosophical way for treating myths like the above of the Spirit-Fire, is neither to refer them to wilful attempts to deceive, on the part of their authors, nor attach historical importance to them, as the necessary alternative of our favourable judgment of those who first circulated them in all singleness of mind. They often, no doubt, originated among simple, credulous, loving, and imaginative people, in early times, much as dreams do with ourselves. The physiology of dreams is pretty well understood. An impression is made on a particular set of nerves, which acting on the brain, produces a dream. For example, a man in his sleep pulls the clothes over his face, and soon, under the impulse of impeded respiration, wakes in the midst of a deadly struggle, as he supposes, with a robber, who is endeavouring to suffocate him. Or again, it is not improbable that some who read these pages may have themselves experienced the instance described by Lucretius in the following rough but effective lines:

"Flumen item, sitiens, aut fontem propter amicum  
Adsidet, et totum prope faucibus obcupat amnem.  
Pueri saepe, lacum propter, seu dolia curta,  
Somno devincti, credunt se extollere vestem:  
Totius humorem saccatum corporis fundunt:  
Quum Babylonica, magnifico splendore, rigantur."

De rerum naturâ, Lib. iv. 1022.

<sup>1</sup> About three miles.

Now the account above given of the Spirit-Fire proves, I think, that such myths arise by a process something similar to dreams. An action in the life of a popular hero or teacher, or a natural object or phenomenon, creates a certain impression on the imaginative but untutored brain of a man in a rude or credulous age, and straightway the busy brain weaves a nexus of events round the prominent idea, just as the brain of one of ourselves does in sleep under the peculiar stimulus of some nerve or other which is stimulated into action for the time being or affected by some accidental cause.

In the present age, too, we are so accustomed to submit all questions and statements to a rigid and searching examination, that we are too apt to forget, that this critical frame of mind was wholly wanting in those early days when the bulk of myths sprang into existence.

It happens, moreover, that, from personal psychological experience, I can offer a still more circumstantial explanation of the genesis of myth, and the promulgation of absolute myth, the product of the imaginative exercise of the brain, in all good faith and honesty, for actual occurrences, and I believe that the experience I am about to describe affords a key to the origin of all marvellous, not to say incredible stories, or myths as we call them, from the mouths of men whom we know or have grounds for supposing to be veracious and trustworthy, however wild their utterances.

I was once working in the Punjab, and had devoted much and deep thought to the question of the 'erratic' blocks found along the course of the Sohan river below Rawal Pindlee, and near its junction with the Indus. The point to decide was, had these blocks travelled up the valley of the Sohan from the Indus, rafted by ice during floods (as I now believe them to have done), or were they transported with 'moraines' down the course of the stream from the Murree direction? Whilst this question was occupying much of my thought, I one night dreamed that I had found a fine collection of these 'erratics' close to the trunk road in the bed of the Sohan. On rising I had no recollection of any dream, but during that day or the next, the recollection that I had *seen these erratics* came so strongly back on me, that I entered the circumstance in my note-book. Some short time afterwards, crossing the Sohan river nearer to its source, I was surprised to find no erratics in its bed, and as my efforts to remember the particular details of the arrangement of the 'erratics' lower down were futile, though I remembered the *fact of having seen them* (as I supposed), I took an early opportunity of examining the spot near the trunk road, where I believed them to occur. On visiting the spot, *no erratics* were to be seen, so that I had not only been myself deceived by a dream, but I was for a time wholly ignorant that it was a dream, and not a real observation I was relying on. That is all, and a very curious and pregnant psychological experience I consider it; for give a wide application to the principle or key here disclosed, and we are at once enabled to reconcile the veracity and good faith of the writers of many a marvellous story or myth with the supremacy and the undeviating operation of the Laws of Nature, whose suspension would otherwise seem necessary before such myths could be really believed. Had circumstances not permitted, and led to a re-examination of the ground, in the above instance, and had I not fortunately undeceived myself in time, I should have gone on believing as a fact, what was in reality the mere product of unconscious action in my own brain.

In connexion with the evolution of marsh gas, I may make a passing allusion to the phenomenon "Will of the Wisp," which is well known in Burma, and to explain which a myth has sprung up just as happened in the case of the Spirit-Fire. The following passage relating to the subject was written by myself and published in the Journal of the Asiatic Society of Bengal for 1863, page 299.

"In Burmah it is believed that there is a class of wizards whose heads become dissociated from their bodies during the night, and wander about the jungle feeding on carrion, the bodies remaining at home, and the Ignis-fatuus is supposed to proceed from the mouth of one of these wandering heads. If a head is secured whilst abroad, it loudly claims to be released, and if detained more than twelve hours from rejoining its body, both head and body perish, and it is believed that such heads have often been captured, though I need hardly add none of my informants had themselves seen one.

"This superstition calls to mind the one formerly current in Europe, that the body of a witch might remain at home, or its semblance, whilst the spirit was at its evil

practices abroad; hence the inutility of an *alibi* for the wretched beings accused of witchcraft. In India *ignis fatuus* is commonly known by the name of *Bhutni*. It usually occurs near villages, and about tanks, marshy spots, or in flat malarious country. The phenomenon is very common around the Rajmahal Hills, on the flat alluvium near the hills, and the best instance I ever witnessed, was near one of the Bungalows built by the late Mr. Pontet, near where the railway passes, but the exact name I have forgotten.

"It was a cold night in January, when, about nine o'clock, I was called by my servant (in accordance with previous directions), and told that 'many *Bhutnis*' had come out. Sure enough, several lights were visible moving about a little, but usually not far from one spot. I think I must have watched one at some 300 yards, for a quarter of an hour, and can only describe it, without suggesting an explanation, save that it may have possibly originated with some luminous insects collected together. The light had all the appearance of an ordinary *musul* or oil-torch, and appeared fully as large and as bright. It had the appearance of emanating from some slowly consuming body, with the evolution of phosphorescent fumes, but this might be merely the effect of a vivid light on the dense cloudy stratum of fog at that particular spot. The night was still, but an occasional puff of air would alter the motion of the light, which however seemed to possess the power of independent motion. The light faded, or even disappeared under a stronger breeze, to re-appear on its dying away.

"The spot where this light I am describing centred was near a tank in some flat ground traversed by a small sluggish stream, and a tank margin is a common place for such light to be seen on. I can add little more regarding the mysterious appearance, save my conviction that its origin has yet to be traced out and established, my own belief in favour of its being due to a congregation of luminous insects, being provisionally adopted for want of a better, and from the fact, as I take it, of the light shifting its position independently of the wind, whose stronger force only causes its temporary extinction. I have forgotten perhaps the most important observation I made with respect to this light, viz. that it is decidedly fluctuating, like that of a revolving light of a lighthouse. After a certain period of ordinary brightness, the light increases in size and brilliancy, and rapidly attains its maximum effect, after which it slowly fades, sometimes to a mere speck, barely visible, or even disappears for a minute or two."

It is not a little curious that the history and causes of this remarkable natural phenomenon should have so long resisted the endeavours made to ascertain them, and the question is suggested as one very worthy of attention by all favourably situated for the purpose.

#### SEA ANEMONES (Page 48).

Since the brief notice of these beautiful forms was printed off, a few verses have occurred to me from *Punch* which I copy chiefly for the information they contain touching the edibleness when cooked of sea anemones, which is certainly not generally known, and, if true, might under some circumstances be worth knowing.

Oh! merry is the Madrepore that sits beside the sea;  
The cheery little Coralline has many charms for me;  
I love the fine Echinoderms of azure green and gray,  
That handled roughly, fling their arms impulsively away.  
Then bring me here the microscope, and let me see the cells  
Wherein the little zoophyte, like garden floweret, dwells.

We'll take the fair anemone from off its rocky seat,  
Since Remdeletius has said, when fried, 'tis good to eat;  
Dyspeptics from 'Sea Cucumbers' a lesson well may win,  
Which blithely take their organs out, and then put fresh ones in:  
The Rotifer in whirling round may fairly bear the bell,  
With Oceanic Hydrozooids, that Huxley knows so well.

You've heard of the Octopus, 'tis a pleasant thing to know,  
 He has a ganglion makes him blush not red, but white as snow :  
 And why the strange Cercaria, to go a long way back,  
 Wears ever, as some ladies do, a fashionable 'sack.'  
 And how the Prawn has parasites, that in his head make holes,  
 Ask Dr. Cobbold, and he'll say they're just like tiny soles.

Then study well Zoology, and add unto your store  
 Tales of Biogenesis and of Protoplasmic lore :  
 As Paley neatly has observed, when into life they burst,  
 The Frog and the Philosopher are just the same at first,  
 But, what's the *origin of life*, remains a puzzle still,  
 Let Tyndall, Haeckel, Bastian, go and wrangle as they will.

#### WALKING CORALS (Page 18).

One of the most curious corals perhaps known is that which may be popularly designated a walking coral, from the fact that it is in the habit of moving about along the sandy bottom of the sea, or in an aquarium, where its motions may be observed, and which never fail to strike with wonder those who behold them for the first time. The above designation, however, is only applicable in a popular sense, as it is not the coral itself which originates the motion in question, but a species of worm or *Siphunculus* (as it is commonly regarded) lodged in the base of the coral, and between which and the coral a parasitic relationship would seem to exist, which is one of host and lodger rather than of 'commensals,' as it is sometimes described. So obscure, however, is the life history of the relationship between these strangely associated mates, notwithstanding the amount of study that has been bestowed on them, that I think a few remarks will not be out of place here, if only for the purpose of directing the attention of observers favourably situated for procuring the living animals and studying their history and development either in an aquarium or in their native waters; as one species is common on the Arakan Coast, and is easily procurable with a dredge in a few fathoms of water in sandy coral ground, e.g. off Corangi Island, where I have myself dredged it abundantly.

There are many species known from the Eastern seas.<sup>1</sup> *Heteropsammia Michelini*, Milne-Edwards et Haime; *H. cochlea*, Spengl; *H. Borbonica*, Brug.; *H. aspera*, Brug.; *H. Persica*, Brug.; *H. Australis*, Brug.; and *H. multilobata*, Moseley; but as they all are specifically differentiated by means of the characters of their framework and peculiarities of the calyces and septa, and all agree in the presence within their base of a *Siphunculus*, or lodger, it will suffice to consider the first-named species, with which alone I am personally familiar in the living state, and which is plentiful on the Arakan Coast.

It is interesting here to observe that a closely-allied coral, *Heterocyathus parasiticus*, displays a scarcely less curious relationship between itself and a *Siphunculus*, but with a difference, which seems due to the fact that whereas *Heteropsammia* is a free coral at all stages, *Heterocyathus* is fixed in its mode of growth, attaching itself to dead shells, as *Corithium* and the like. In the case of *Heterocyathus*, however, the *Siphunculus* is said (for I cannot speak of my own knowledge) to occupy the shell whereunto the coral is attached, and its so doing would scarcely challenge any particular notice, but for the fact that in an allied and free coral, *Heteropsammia*, the *Siphunculus*, instead of occupying the shell, is found occupying a cavity in the base of the coral. Now the question of how the *Siphunculus* lodger originally obtained access to the interior of the *Heteropsammia* host, and that regarding the less intimate relation between the same, or an allied species of *Siphunculus*, and the fixed *Heterocyathus*, is of a somewhat similar though modified character, and raises so many issues,

<sup>1</sup> For these names and other information regarding the subject I am indebted to the courtesy of S. O. Ridley, Esq., M.A., on the Scientific Staff of the British Museum (who is, however, not responsible for the views here put forth).

that the case hardly admits of being fully stated without a certain amount of prolixity, which I would gladly avoid; and there is, moreover, the difficulty that some points in the history of these creatures, almost essential to a satisfactory verdict, have not been settled by observation, or more than barely touched by negative evidence of very limited scope. The points, therefore, I shall now draw attention to, are submitted, not with the expectation of their largely conducing to a positive conclusion, but to show that there exist certain difficulties in the way of the unreserved acceptance of the generally received notion that the parasitism of the *Siphunculus* and the *Heteropsammia* is in kind identical with that of any extraneous lodger, who takes up his abode in the body of another animal, as the *Palaeo penetrans* does beneath the human integument, or the female *Stylops* within the body of the bee.

*Heteropsammia Michelini* is a perfectly free coral of rather less usually than three-quarters of an inch in its longest diameter and pyriform in the horizontal section of its base. The basal surface is smooth, and at the narrow end is perforated by a circular hole, which is the external opening of a curved tube lodged within the base of the coral and forming a regular curved gallery therein, occupied by the *Siphunculus*. Above, the coral is crowned by an ordinary calyx, either narrowed or constricted in the middle, or divided into two separate calices, which are ranged unsymmetrically and without reference to the elongate axis of the horizontally pyriform base. The relations and character of this gallery or tube demand careful consideration, and the following points regarding it, both negative and positive, may be dwelt on, as helping to solve the question of its origin and precise connexion with the coral wherein it is lodged.

Firstly, it would seem to be a concomitant structural character necessarily present in *Heteropsammia*, and included therefore among the characters of that genus. This would not be the case were any instance known of specimens of this genus unprovided with the gallery in question. The gallery is not formed by a shelly tube, such as invests the burrow of a *Teredo*, or is secreted by a *Spirorbis* or *Vermetus*. The wall of the gallery is composed of the naked coral skeleton, and its existence is due simply to the arrested growth of that structure, as round some foreign body. Now in considering this gallery or tube, under the conditions above described, we have three separate reasons for doubting the ordinary and accepted view of its relation to the structure which incloses it. There is the fact that without this gallery there is no *Heteropsammia*, and on the supposition that the gallery is simply bored by the *Siphunculus*, as a *Teredo* might bore into a log of wood, we have the remarkable fact to dispose of, that no *Heteropsammia* is ever discovered which has escaped attack, and the no less remarkable fact that no *Heteropsammia* is ever seen attacked by more than one *Siphunculus*, and also that the *Siphunculus* in question confines his ravages to a few species of the genus *Heteropsammia*, which is strange, if we suppose the *Siphunculus* to be possessed of the power and will of boring into the structure of living coral.

Secondly, a number of aquiferous pores or tubes, forming a ring below the calyces on the upper surface, communicate with the internal gallery, and bear, I think, strong evidence to its structural relationship to the coral wherein it is situated. For, granting that the *Siphunculus* is possessed of the power of excavating for itself the cavity where it is found lodged, yet the same organs which would serve to excavate the larger tube could hardly be so adapted as to perform the task of making the minute perforations, at right angles to the main tube, which I have termed aquiferous pores, whose function is clearly to admit the ambient sea to the internal gallery, or at least to bring it within access of its wall. Doubtless these aquiferous pores are advantageous to the *Siphunculus* occupying the gallery, but that they were formed by that creature is by no means equally clear.

Thirdly, the pyriform shape of the coral, with its evident co-relation to the growth of the *Siphunculus*, completely disposes of the idea that the adult coral is attacked and perforated by the *Siphunculus*, as in that case there is no reasonable explanation why the orifice should be lodged in the advanced portion of the coral, and in that case the *Siphunculus* having effected its entry into the viscera (speaking metaphorically) of the coral, would be compelled to turn round on itself within the narrow compass or gallery which it so completely fills. For the position of the *Siphunculus* is that of its

head exactly fitting the external or I may say terminal hole, from which it is protruded, for the purpose of hooking itself along, coral and all, much after the manner of progression of a caddis larva. We are thus forced to suppose that the young *Siphunculus* (in what precise stage, it is much to be regretted, we do not seem to know) makes its on-slaught on to the equally young *Heteropsammia*, and having effected a burglarious entrance into his host's premises, to wit his host's body, lives on amicable terms with him ever after. That the union of host and lodger is a life-long one, and cemented in early infancy, cannot, I think, be questioned; but is not the generally received notion of the respective part played, rather arrived at by begging the entire question?

In view of some of the difficulties suggested above, is it not equally probable that the *Heteropsammia* is epizootic on the *Siphunculus*, as that the *Siphunculus* is a fortuitous occupant of the substance of the coral? I see no insuperable absurdity in the notion that just as *Heterocyathus parasiticus* selects dead shells for its perch, either tenanted or not by a *Siphunculus* or other creature, so the embryotic *Heteropsammia* may select the body of a *Siphunculus* whereon to perfect its development, and if, as is not unlikely, there may be a mutual advantage in this queer association, it may or may not happen that the act is acquiesced in by the *Siphunculus*, or that it may not have the power of defending itself from this unsought copartnership. The true solution of this question depends, I think, on the close observation of the living *Heteropsammia* in its earliest stage, and also on determining whether the *Siphunculus* found tenanting it, is found to occupy any other shelter; in a word, the satisfactory solution of this curious problem awaits minute observations of the animals, which have yet to be made by some one gifted with the patience as well as the opportunity of carrying them out successfully.

#### NEPHITHYA BURMAENSIS, Ridley (Page 18).

Since the preceding pages have been printed a species of Alcyonarian sponge, collected by myself, has been described by S. O. Ridley, Esq., in the Annals and Magazine of Natural History for March, 1882, from which paper I extract the following remarks:—

##### ALCYONINE.

##### NEPHITHYA, Audouin.

The only described species which can be admitted in this genus, as distinguished from *Annotheca* by the large size of its cortical spicules, from *Eunephthya* by their not projecting from the surface of the coenenchyma, and from *Spongodes* by the polype-spicules not projecting beyond the retracted polype, are—

*N. CHABROLII*, Audouin.

*N. (ALCYONIUM) AURANTIACA*, Quoy et Gaim.

*N. COCCINEA*, Stimpson.

*N. AURANTIACA*, Verrill.

*N. NIGRA*, Pourtales.

To the above a new species is now added, *N. Burmaensis*, from the Arakan Coast, near Negrals. After describing it in detail, the author adds:

"The species is represented by a small colony of three primary lobes rising from the common base, which clasps a small calcareous mass; . . . From all the species assigned above to the genus, either the pale colour of the soft parts or the whiteness of the spicules distinguishes it; *N. Chabrolii*, which seems to have the dull general colouration, differs in its very large polypes and their green spicules. *N. niger* is, of course, black; and if the costæ assigned to it are ridges resembling the costæ of Madreporaria, they constitute another point of difference."

#### MUSICAL FISH (Page 188).

The only account that I am aware of that has been printed, of musical sounds being produced by fish in Burmese waters, is by the Rev. C. Parish, who has kindly

drawn my attention to several notices of this obscure phenomenon, in *Science Gossip* for 1870, including his own observations on the coast between Tavoy and Mergui, which I now quote.

"In the month of February, 1857, having waited at Tavoy a long time in vain for the arrival of the Maulmain steamer to take me on to Mergui, I determined to make the voyage in a native boat.

"The distance from Tavoy to Mergui is about one hundred miles, viz. forty down the Tavoy River to its so-called mouth, really a broad estuary, and thence sixty miles by sea. The greater portion, however, of these sixty miles is shut in from the Bay of Bengal by the northernmost islands of the Mergui Archipelago, and the sea is comparatively shallow, with a muddy bottom all the way. It is but a short night's run for a steamer, but I was three days and three nights performing the distance.

"When about forty miles (as I suppose) from Mergui, where the breadth of the sea, between the main and the islands, is about ten or twelve miles, on the night of the 10th of February, I was overtaken by a violent storm of thunder and lightning, accompanied by strong winds and torrents of rain, which lasted nearly all night.

"The wind blew from the south, *i.e.* from Mergui; but had it been favourable, we could not have ventured to hoist a sail, on a pitch dark night, in a round-bottomed canoe, during such a storm. So we '*dropped the stone*' as the Burmese say, or let go the wooden anchor, weighted with a stone, crouched all together (*i.e.* the two Burmese boatmen, my native servant and myself) under the covered part of the boat for shelter from the driving rain, and '*wished for day*.' The storm was followed the next day and the succeeding night by an absolute calm. Not a breath in the sweltering air, not a ripple on the oily sea! The boat lay motionless, drifting with the sluggish tide when that was favourable, anchored when it was contrary, for it was too heavy a boat for two men to row. Nothing moved but the sun, and he, all too slowly. Not a sound reached the ear, and the haze shut out the sight of the land on either side.

"When night fell again, and the stars shone out bright and clear, the same calm continued, and we lay still and motionless as ever. But with the growing darkness there came a sound upon the ear, a strange and peculiar sound, though from what quarter it came, it was difficult to determine, for it was not *borne on* the air from a distance; had it been so, I might have fixed upon the direction whence it came, but it was above, below, and around. The air was all sound, and the sound was all of one kind and pitch, a droning, drowsy sort of sound, and unintermitting. It is difficult to convey in words a correct idea of the sound, no articulate sound would resemble it. M. de Thoron, as quoted by Mr. Spicer, compared what *he* heard, to the music of an organ listened to, outside a church, where, I suppose, all distinction between one note and another would be lost, and a confused vibration would be the result. What I heard might, somewhat fancifully, be so described. He says the noise was '*grave and prolonged*,' so was this. The nearest approach to a true description of the sound (as, at least, it seemed to me) which I can give, is to imagine a huge drum beaten, at short and regular intervals, a long way off, and the sound coming across the water in sustained waves of varying intensity. The sound, however, can be pretty closely imitated by closing the lips, keeping the teeth apart, and then trying to utter the letter M in the deepest possible tone, and with prolonged breath, the result will be an inarticulate *Hum*.

"I could not imagine whence such an unusual sound proceeded, nor could I learn from the boatmen what it was. At that time I was not aware that fish had '*voices*,' or that they could utter sounds of any kind. I was slow therefore to attribute the sound to them, although I felt sure, after a while, that it rose out of the sea all round me. Now, however, I am satisfied (and have been for some time) that the mysterious sound proceeded from the fish in the sea, though from fish of what kind I do not know; and that M. de Thoron and myself have witnessed the same phenomenon in two very different parts of the world there can, I think, be very little doubt."—*Science Gossip*, 1870, p. 117.

Charles Kingsley describes the sound usually supposed to be made by fish, in the case of the Bocas Islands, off Trinidad, as follows: "The noise I heard is

a simple drumming, exactly like a steamer letting off steam, which I attributed at first to wind or to water in the caves, but I accept the native explanation. I have a specimen of the fish, which is said to make the noise, but I don't believe in its power to do so."—*Science Gossip*, 1870, p. 95.

On this Dr. Günther remarks to the following effect: "The musical fish which has been observed by Prof. Kingsley, during his visit to the West Indies, is well known under the name of *Pogonias chromis*. All writers on North American Ichthyology speak of the 'Drum,' 'Drummer,' or 'Grunts,' and speak of the peculiar noise produced by it under water. . . . It is a fish like the Maigre, growing to a length of four or five feet, found in American waters north and south of the line. Other allied species are found in the East Indies, where they have also been observed to astonish the sailor by their music. So much is certain. 1st, That the noise is produced by this fish, or similar species, which generally go about in schools or herds. 2nd, That the sound is not produced by means of the air-bladder (which is perfectly closed), as some suppose. I believe the sound is produced by the action of the enormous upper and lower pharyngeal teeth, with which three movable plates in the gulph are armed. These teeth have the form of paving stones."

After this, it may be safely assumed as beyond doubt that a dull noise is made by some species of fish, by the friction of their mandibular or pharyngeal teeth, and that this noise may be described as a prolonged droning sound, very different from the articulate utterance of any other vertebrates. Other observers have described these sounds in China, Ceylon and Bombay, to mention only some instances:

Dr. Adams describes the "Drum fish" of Macao as assembling every evening round a ship (at anchor?) and keeping up a musical humming till about midnight. The noise rises or falls or suddenly ceases at times as they quit the ship in search of food.—"*Cycl. of India*."

Sir Emerson Tennent describes the sound thus: "I distinctly heard the sounds in question. They came up from the water like the gentle thrills of a musical chord or the faint vibrations of a wine glass when its rim is rubbed by a wet finger. It was not one sustained note, but a multitude of tiny sounds, each clear and distinct in itself; the sweetest treble mingling with the lowest base."—*Science Gossip*, 1870, p. 97.

Another writer describes similar sounds, heard by him near Salsette (Bombay), and says the fish nearly resembles the European perch (*i.e.* *supra*).

It does not, however, follow that because it is an established fact that fish of the genus *Pogonias*, and probably others as well, can produce muffled and guttural sounds by the friction of variously disposed dental plates, that therefore all the sounds which have been referred to fish, are correctly so referred.

Kingsley's comparison of the sound he heard to the letting off steam, suggests another origin which may possibly exist in some places for these mysterious sounds. In various spots along the Burmese coast, especially in Arakan, but also down so far south certainly as Cape Negrais, a considerable evolution of marsh gas takes place, which being generally accompanied with a feebly saline spring, gives rise to the '*mud volcanoes*,' so called, of that region. These outbursts of mud have no connexion with volcanic energy properly so called, but are dependent on the evolution of marsh gas, which is sometimes so copiously discharged as to simulate in a dark night by its ignition, the flames which people suppose would accompany an actual volcanic outburst. Now there is no reason to suppose that this discharge of gas, which in numerous spots in Pegu and Arakan is ceaselessly kept up, is confined to the land: on the contrary, it can hardly be doubted that in many spots, submarine points of issue must exist, identical with those we have the means of examining on shore. This being admitted, it seems probable that under favourable conditions, that is, during a perfect calm in both sea and air, a copious and uninterrupted submarine discharge of gas might give rise to an uninterrupted and muffled sound not dissimilar to that described by Mr. Parish and Mr. Kingsley. I do not venture to say that this is the origin of the sounds in question, but merely record what seems to me a possible and unsuspected origin for such sounds, as might otherwise be referred to fish.

I may in conclusion make a passing allusion to those mysterious sounds called 'Barrisal guns.' For an exhaustive account of this phenomenon reference may be



made to the Journal Asiatic Society of Bengal, 1870, pp. 289 and 243. Mr. James Rainey writes: "I have the honour to bring to your notice the occurrence in the districts of Buckergange and Jessore, and over as far north as Farreedpore, I believe, periodically during the prevalence of the S.W. Monsoon and rainy season, of certain peculiar noises, from the south and south-east directions or seaboard, resembling the report of canons, or loud explosions, usually heard distinctly after a *heavy fall of rain or cessation of a squall, generally whilst the tide is rising.*" The generally received opinion seems to be, that these sounds, resembling a distant cannonade, really proceed from the surf breaking explosively, if I may use the term in this connexion, on the coast. But if this is so, may we not suppose that the ceaseless roll of a moderate surf, after a storm, might, to any one anchored some miles off, in a still night, so fall on the ear as to fill the air with its murmur, or, as Mr. Parish phrases it, "the air was all sound," without supposing that fish were connected with its production? The Burmese boatmen, too, were unaware of any fish capable of causing it, though in places where such is the case, the phenomenon in question is commonly understood, and the fish implicated in its production known to the inhabitants. Doubtless fish capable of producing sounds are met with on the Burmese coast, but a little more corroborative evidence to connect the phenomenon described by Mr. Parish with such an origin, would be acceptable, though Mr. Parish has himself (and who should know better?) no doubts on the subject.

A writer who signs himself W. C. P., in the same number of "Science Gossip" that contains the paper by Mr. Parish, describes the sounds referred by him to fish in the following words: "Off Ceylon we were about one hundred miles north of Colombo, eight leagues from the shore, and in a depth of water exceeding one hundred fathoms, time shortly after sunset. When the sounds were first heard, they might have been taken for faint echoes of music from the distant shore, until, after listening attentively, they were found to come up from below the surface of the sea, and fell upon the ear something like the tones of an Æolian harp, rising and falling in regular cadence, and impressed the mind with a sense of something distinct from what had ever been experienced before." The next morning some "*sucking fish*" (*echeneis*) were captured, whereon W. C. P. at once concludes that they caused the sound by means of the suetorial disk which is placed on their heads!! He goes on to add: "This supposition is strengthened by the fact that if the ear be laid upon an adjoining part of the vessel while the sounds are heard, the source of them seems to be in *contact* with the vessel, and no longer at a distance, as when the ear is detached." This sentence shows, what is too liable to be lost sight of, the difficulty of judging the precise direction whence such diffused sounds originate, and also points, I think, to an unsuspected source, namely, the rigging of the vessel. Whoever has stood beneath a post sustaining a telegraph wire, will remember the loud (or soft it may be) sound produced by a gentle air rippling over the wire, and I cannot but think that during a calm, with just perhaps a faint air in the rigging, sounds such as described above, as being in "*contact with the vessel*," may be thus produced, rather than by "*sucking fish*" fastening themselves to the sides of the ship, or any external source whatever. The following remarks, by the Rev. C. Parish, on the possible connexion of some such obscure phenomenon, with the pretty conceit of the Sirens, will be read with interest by all who delight in ancient myths and the stories which have survived from times of yore to the present, the veritable intellectual *flotsam and jetsam* of our race in its infancy.

"As it is probable that most fabulous stories have some foundations in fact, being but an exaggeration of the fact, it appears to me far from unlikely that the fable of the Sirens is traceable to the sound made by so-called musical fish.

"The ancients must have heard those sounds, though, perhaps, at some intervals—for, after all, the recorded instances even now are not numerous; and they certainly could not have understood that which, at this distance of time, is still a subject of inquiry. The Sirens were supposed to be Sea-nymphs who lured mariners to destruction by their song. It would appear that the sounds made by musical fish are only heard in the night, beginning at nightfall. It was thus on the only two occasions on which they were heard by me: once at sea, as recorded above, in the night; and

once in the river Gyne, at sunset, when the air was perfectly still, and the broad reach of the river below Damathāt was like glass. The sound heard in the river was very different from that heard at sea, evidently made by a different fish. The latter was of a *booming* nature, the former, though difficult to describe in words, was rather what I may call *crepitant*. Many times, and oft, as I have been over the same reach of the Gyne, I never heard the sound except on that single occasion. When I called the attention of the Burmese in the boat to it, they said that fish were very abundant at that particular spot. To return, then, to our subject, what more probable than that, in ancient times, sailors hearing these mysterious sounds all around them on a dark and stilly night, may have been tempted to follow on in the direction from which they fancied the sounds proceeded, and thus ran upon rocks: or, they may have drifted unconsciously into danger while listening to the strange voices? Nothing is more likely farther, than that they should have taken the sounds to be supernatural.

“It was as a calm fell—just such an one as I have described—that Ulysses and his crew heard the Sirens.

Ἀντίκ' ἔπειτ' ἄνεμος μὲν ἐπαύσατο ἡδὲ γαλήνη  
Ἐπλετο ηἰνεμένη, κοίμησε δὲ κύματα δαίμων.

Od. xii. 168-9.

‘Sunk were at once the winds, the air above,  
The waves below, at once forgot to move!  
Some demon calmed the air and smoothed the deep,  
Hushed the loud winds, and charmed the waves to sleep.’—POPE.

More literally—

Then fell the wind at once—a breathless calm  
Prevailed around—some spirit hushed the waves.

“Warned beforehand by Circe of their danger, they strove to pass the spot unnoticed, but they could not thus evade the quick-eared sea-nymphs, and soon heard the captivating sounds fall on their ears:—

πᾶς δ' οὐ λάθην ὠκύαλος νηὺς,  
Ἐγγύθεν ὀρνυμένη, λιγυρὴν δ' ἔντυνον αἰοδῶν.

Od. xii. 182-3.”

#### THE MIOR OR GREAT BASKING SHARK (Page 284).

The name ‘Basking Shark’ would seem to be applied rather loosely to any large shark, but is properly applicable, as Dr. Günther has kindly informed me, to the huge but harmless *Rhinodon typicus*, Smith. Specimens of this shark are almost unknown in English museums, but the teeth are extremely minute, almost in inverse proportion to the huge dimensions of the animal, and probably when the membrane wherein they are implanted is fresh and soft, they are even less conspicuous than in the dried skin, when they scarcely attain the tenth of an inch. In fact, the risk one runs from these huge monsters is more of their upsetting the boat by scraping their backs along its side, than from their teeth. Mr. Swinburne Ward has described this species as visiting the Seychelles frequently, but as not being known north of the Equator. This probably is a too hasty generalization, but it is all the more desirable that those favourably situated for so doing, should put beyond doubt what species it is that grows to such huge dimensions (as recorded) off the coast of Kurachi.

Mr. Swinburne Ward, in a letter to myself, says that young specimens of *Rhinodon typicus* are unknown, and that, except a specimen thrown on shore at the Cape, no other locality for this species is known, except the Seychelles. This, of course, is merely another way of saying that we know nothing of these fishes, and their study is no doubt somewhat difficult in a warm climate; but a recognition of the interest that attaches to the specific identification of an Asiatic shark should lead to some successful attempts to preserve enough materials to fill up this gap in our knowledge. With reference to this question of distribution, I well remember, many years ago, Mr. Blyth’s procuring a small shark from the Sand Heads, which greatly puzzled him,

as he could detect no teeth whatever in its jaws, when the specimen was pretty fresh, and he was tempted to conclude that they must have been removed, though no traces of the operation could be detected. Could this specimen have been a young *Rhinodon*? The *Squalus maximus* is also called the Basking Shark by the whalers, and according to Mr. Swinburne Ward, it has inoffensive jaws, similar to the *Rhinodon*, "and probably feeds in much the same manner by crushing shells and sucking the contents." At a place like Kurachi, where there is an actively pursued shark fishery, it should not be difficult to find out what food these large but feebly-toothed sharks consume, and the matter should be always remembered whenever an opportunity presents itself for solving the question of the habits of the *Squalus maximus*. Mr. Swinburne Ward remarks: "They are very easily harpooned, but if, from the small size of the boat you are in, you are obliged to give them line, they roll it round their bodies, sink to the bottom, and bury themselves so deeply in the sand or mud that nothing will move them. Hold on to them, and they are easily finished with the lances."

#### PRISTIDÆ (Page 286).

A specimen of a snout of a *Pristis*, procured by me at Madras, measures four feet and three inches, and how much is missing towards the head I can't say. The 'teeth' are nearly equidistant, 16 on one side and 17 on the other, the first pair being 4 inches and the last pair 10 inches apart from each other across the snout. At its base the snout is mesially a trifle over 2 inches in thickness.

#### CATALOGUE OF BATRACHIA SALIENTA.

By GEORGE ALBERT BOULENGER, 1882 (Page 289).

##### BATRACHIA.

##### Order ECAUDATA.

##### Sub-order PHANEROGLOSSA.

Eustachian tubes separated. A tongue.

##### Series FIRMISTERNIA.

##### Family Ranidæ.

Maxillary teeth. Diapophyses of sacral vertebræ slightly or not at all dilated.

##### a. Pupil horizontal.

##### OXYGLOSSUS, Tschudi.

O. LIMA, Tschudi.

Java. Siam. Camboja. Pegu. China.

O. LEVIS, Peters.

Philippines. Pegu.

##### RANA, Wagler.

Tongue more or less deeply emarginate. Teeth on the vomer. *Fingers perfectly free. Toes webbed, with simple or dilated tips.* Omersternum and sternum with a bony style.

Under *Rana* Boulenger includes many species of truly arboreal frogs,<sup>1</sup> justifying his so doing in the following words: "The study of the numerous species included here in *Rana* shows the impossibility of dividing them into genera, or even subgenera, according to the dilatation or non-dilatation of the tips of the fingers and toes. The extreme forms, viz. *Rana heradactyla* and *R. afghana*, show indeed a very marked difference respecting the shape and structure of the fingers and toes, the former having them pointed, the latter dilated into very large disks supported by regularly T-shaped phalanges. But when we meet with such forms as *R. Malabarica*, *R. curtipes*, *R. inguinialis*, etc., we must hesitate before referring them to the '*Platydactyla*'

<sup>1</sup> Has any one, I may ask, ever seen a *Rana*, as hitherto understood, in a tree?

or to the 'Oxydaetyla,' and in fact they might just as well be referred to the one as to the other. Besides, the well-known *R. macradon*, *R. Kuhlîi* and others have the tips of the toes dilated into very distinct disks, much more so than several species hitherto referred to *Hylorana*.

"I have therefore come to the conclusion that, with regard to the species of this group, the difference in the shape of the fingers and toes cannot be used as a generic character, as we should be obliged to place far apart species which in all other respects are very much alike."—Cat. Bat. Sal. p. 7.

Now the difficulty here stated is not one exceptionally encountered among *Batrachia*, but one which has to be confronted in every department of Zoology, and which must be solved, I think, after a very different fashion to that adopted above, for I cannot think that naturalists in general will agree that the fact of an animal possessing a certain mixture of characters, colourably sufficient to allow of its being referred to either of two genera, is a sufficient and a proper ground for uniting these genera, otherwise sufficiently differentiated. There are two courses in such a case, which are preferable to the heroic one advocated in the case of *Rana*, either by weighing the balance of characters, so as to determine the preponderating value of one set, in a particular direction, or of modifying the characters of the genus, to the extent of meeting the requirements of the species claiming admission therein.

The development of pneumatic pads, as seen in the typical tree frogs, is, it seems to me, a clear indication of arboreal habits, and, as such, a natural and adequate reason for the at least subgeneric separation of such forms, from those not possessing that character; and it is no valid objection to this view to argue that there are forms, whose claims to be considered as essentially tree or water frogs, are not very clear. *Natura non facit saltum*, is the true reply to such an argument.

There is however, I suspect, one thing which underlies much of this desire to unite very dissimilar forms, and that is, a certain confusion which has undoubtedly prevailed regarding the dilated extremities of Batrachians. Whilst tree frogs have the extremities of their fingers enlarged into disks, which are functionally pneumatic organs of adhesion, other Batrachians, of the most helpless and grovelling habits, have their digits terminally enlarged also; for example, *Callula pulchra*: but in this case the enlarged ends are not pneumatic organs, and not improbably subserve the purpose of punching out a cavity in stiff clay, when the animal is desirous of retreating during the dry season into a subterranean burrow. In like manner, the sharp digits of a typical *Rana*, as *R. hexadactyla*, may be of use to the animal in seizing hold of, and making good its footing in soft mud; but be this as it may, the principle seems preferable of endeavouring to follow the indications afforded, regarding the natural habit of the animal, when so clearly given, as in the case of the pneumatic disks of *Polypedates*, than to dispense with such aids towards a natural classification—with the result of having to adopt so unnatural an arrangement, as I hold the union of *Rana* and *Polypedates*, in their typical forms at least, to be.

Some highly aquatic frogs, *Lymnodytes* for example, possess pneumatic pads, which are as much use to them in adhering to slippery rocks or logs, as the same organs are in enabling arboreal species to cling to the leaves; but this is only an additional reason for studying the habits of a species, if we wish to assign it its proper place in any natural system, and this aim is altogether frustrated or rendered a work of supererogation, by limiting such a genus as *Rana* by so arbitrary a character as *free fingers*, regardless of the condition they may present of being either acute, clubbed, or dilated into disks, and regardless, of course, of the co-related habits and mode of life they indicate, be it aquatic, sylvan, subterranean, or arboreal.

In the following list, those species to which an asterisk (\*) is prefixed are unrepresented in the B.M. Collection.

*R. HEXADACTYLA*, Less.

Nipal. Ceylon.

*Dactylethra Bengalensis*, Less.

*R. cutipora*, Dum. et Bib.

*R. robusta*, Blyth.

*R. vittata*, apud Beddome.

- Pyxicephalus phycialis*, apud Jerdon.  
 R. CYANOPHILICTES, Schl. Kashmir. Malabar.  
*R. Bengalensis*, Gray. Ceylon. Pinang.  
*R. Leschenaultii*, Dum. et Bib. Himalayas. Nilghiris.  
*Dicroglossus Adolphi*, Günth.  
*R. hexadactyla*, apud Cantor.  
 R. KÜHLI, Schl. Java. Borneo. Celebes.  
*R. conspicillata*, Günth. Ningpo.  
 R. LATICLES, Boulenger. Khasi Hills.  
*Polypedates affinis*, Beddome.  
 R. YUNANENSIS, Anderson. Ifotha.  
 R. LEBIGH, Günth. Nipal. Sikkim.  
*R. Sikkimensis*, Jerdon.  
*R. Gammii*, Anderson.  
*R. gigas*, Peters.  
 R. MACRODON, Kuhl. Sarawak. Java. Tenasserim. Philippines.  
*R. fusca*, Blyth.  
*Lealus aurifasciatus*, Peters.  
 \*R. PICATELLA, Stoliczka. Pinang.  
 R. TIGRINA, Daud.  
*R. cancrivora*, Boie.  
*R. Brama*, Less.  
*R. vittigera*, Wiegman.  
*R. rugulosa*, Wiegman.  
*R. crassa*, Jerdon.  
*Hydrostentor pantherinus*, Fitzinger.  
*Pyxicephalus fodiens*, Peters.  
*Hoplobatrachus Ceylanicus*, Peters.  
*R. latrans*, David.  
 R. GRACILIS, Wiegman.  
*R. Nilagirica*, Jerdon.  
*R. agricola*, Jerdon.  
*R. brevipalmata*, Peters.  
*R. lymnocharis*, Boie apud Stoliczka.  
 \*R. KHASIANA, Anderson.  
 R. (HYLORANA) MACRODACTYLA, Günth. South China. Burma.  
 R. ANDERSONII, Boulenger. Yunnan.  
*Polypedates Yunnanensis*, Anderson.  
 \*R. (HYLORANA) MARGARIANA, Anderson. Yunnan.  
 R. ALTICOLA, Boulenger. Khasi Hills.  
*Hylorana pipiens*, Jerdon. Maulmain.  
*Hylorana Nicobaricus*, Stoliczka.  
 \*R. (HYLORANA) TYTLERI, Theobald. Burma. Bengal.  
 R. (HYLA) ERYTHREA, Schl. Sumatra. Borneo.  
*Limnodytes erythraeus*, Dum. et Bib. Philippines.  
*Hylorana subcarulea*, Cope. Siam.  
 R. (POLYPEDATES) AFGHANA, Günth. Sikkim.  
*Polypedates marmoratus*, Blyth. (The recorded habitat of Afghanistan  
*Anolops Afghanus*, Cope. is highly improbable.)  
 R. (POLYPEDATES) FORMOSA, Günth. Sikkim. Khasi Hills.  
 R. LATOPALMATA, Boulenger. Tenasserim.

## RHACOPHORUS, Kuhl.

Tongue free and deeply notched behind. Teeth on the vomer. Fingers and toes more or less webbed, the tips dilated into regular disks. Omosternum and sternum with a bony style.

## A. Fingers half webbed.

## a. Heel without dermal appendage.

*Vomerine teeth between the choanae.*

R. <i>HYLA</i> , MACULATA, Gray.	Hong Kong. Sikkim.
<i>Polypedates leucomystax</i> , Tschudi.	Nilghiris.
<i>P. rugosus</i> , Dalm. et Bib.	Bombay. Madras. Ceylon. Borneo.
<i>P. cruciger</i> , Blyth.	Tenasserim.
<i>P. megacephalus</i> , Hallow.	
<i>P. biscutiger</i> , Peters.	
Var. QUADRILINEATA, Wieg.	Singapore. Java.
<i>Polypedates quadrilineatus</i> , Günth.	Philippines.
<i>Limnodytes Celebensis</i> , Fitzing.	Formosa.

## B. Fingers entirely webbed.

## a. No dermal appendages.

*Vomerine teeth in two series on a level with the front edge of the choanae.*

R. MAXIMUS, Günth.	Nipal. Sikkim. Khasi Hills.
<i>R. gigas</i> , Jerdon.	

## b. Heel with a dermal appendage.

R. BIMACULATUS, Boulenger.	Assam and Khasi Hills.
<i>R. Reinwardtii</i> , Jerdon.	
<i>R. maculatus</i> , Anderson.	

## IVALUS, Dumeril et Bibron.

## A. Fingers free or very slightly webbed.

a. *Tympanum not half the width of the eye.*

*I. KAKHIENSIS, Anderson.	Nampoung Valley. Yunnan.
*I. LATERALIS, Anderson.	Burma.

b. *Tympanum indistinct.*

*I. CINERACEUS, Stoliczka.	Maulmain.
----------------------------	-----------

Family **Engystomatidæ.**

No maxillary teeth. Diapophyses of sacral vertebrae dilated.

## CALOPHRYNUS, Tschudi.

C. PLEUROSTIGMA, Tschudi.	Borneo. Pegu.
<i>Engystoma interlineatum</i> , Blyth.	

## MICROHYLA, Tschudi.

M. (ENGYSTOMA) PULCHRA, Hallow.	Hong Kong. Camboja.
<i>Scatophryne labyrinthica</i> , Fitzing.	
<i>Ramnia symmetrica</i> , David.	
M. (ENGYSTOMA) BERDMOREI, Blyth.	Pegu.
<i>Callula natatrix</i> , Cope.	

## CALLULA, Gray.

C. (KALOUA) PULCHRA, Gray.	China. Siam.
<i>Hylodactylus bivittatus</i> , Cantor.	Camboja. Ceylon. Burma.

## GLYPHOGLOSSUS, Günther.

G. MOLOSSUS, Günth.	Pegu.
---------------------	-------

*Family* **Dyscophidæ.**

Maxillary teeth. Diapophyses of sacral vertebræ dilated.

CELLULELLA, Stoliczka.

C. (MEGALOPHRYS) GUTTULATA, Blyth. Pegu.

Series ARCIFERA.

*Family* **Bufonidæ.**

Maxillary teeth none. Diapophyses of sacral vertebræ dilated.

BUFO, Wagler.

\*B. (ANSONIA) PENAGENSIS, Stoliczka. Penang.

\*B. (BOMBINATOR) SIKKIMENSIS, Blyth. Sikkim.

*Scutigor Sikkimensis*, Theobald.

B. HIMALAYANUS, Günth. Nipal. Sikkim.

B. MELANOSTICTUS, Schn. Canton. Hong Kong.

B. *Bengalensis*, Daud. Sikkim. Bengal. Madras. Ceylon. Penang.

B. *isos*, Less. Java. Borneo. Philippines.

B. *dubia*, Shaw.

B. *carinatus*, Gray.

B. *gymnanucha*, Bleeker.

B. *spinipes*, Fitzing.

B. ASPER, Grayenh. Java. Borneo. Tenasserim.

B. GALEATUS, Günth. Camboja.

*Family* **Hylidæ.**

Maxillary teeth. Diapophyses of sacral vertebræ dilated. Terminal phalanges claw-shaped.

HYLA, Laurenti.

H. CHINENSIS, Günth. Southern China.

H. (POLYTEBATES) ANNECTANS, Jerdon.

*Family* **Pelobatidæ.**

Maxillary teeth. Diapophyses of sacral vertebræ strongly dilated. Terminal phalanges simple.

LEPTOBRACHIUM, Tschudi.

Tongue heart-shaped, free behind. Fingers free; toes basally webbed, tips not dilated.

L. HASSELTII, Tschudi. Pegu.

XENOPHRYS, Günther.

Tongue subcircular, slightly nicked and free behind. Fingers free, toes nearly so, and tips not dilated into regular disks.

X. MONTICOLA, Günth. Sikkim. Pegu.

X. *gigas*, Jerdon.

**PICUS CANICAPILLUS** (Page 349).

Speaking of this bird, Dr. Mason says, "The Karens regard it as a bird of bad omen. Whenever its voice is heard, the children are charged not to go out of the house, for it is deemed to be the dog of a witch."

THE TĀL PALM (*Borassus*) (Page 383).

That there may be no mistake, I may say that I cannot remember ever seeing nests of the Baya attached to the Tāl palm—the *Phoenix* being universally selected in preference. The reason is obvious, as the leaf of the *Borassus* does not offer so convenient a basis of attachment as the leaf of the *Phoenix* does.

## CISSA (PSILORHINUS) MAGNIROSTRIS (Page 387).

Of this bird Dr. Mason writes: "General Johnson had one which exhibited all the traits of the English magpie. It would take bones, hide them in a hollow bamboo, cover them up with a rag, and return to them when needed. When a bamboo could not be found, it would hide its spare food under the mat."

## CORVUS SPLENDENS (Page 387).

The cases of birds attacking men in defence of their young are too numerous to need reference or quotation; but birds occasionally attack men, seemingly without provocation. For example, Judge Norman, who was assassinated on the steps of the Town Hall in Calcutta, related to me once that he was standing just outside his house in Calcutta, when suddenly a kite swooped down at his bare head, and with its claws inflicted a severe wound on the scalp. In this case there was absolutely no provocation, neither is it easy to assign any reason for the bird's behaviour. It is just possible, if Judge Norman had a handkerchief thrown over his head at the time, that the bird may have swooped at the handkerchief, supposing it to cover something to eat, but this I cannot say; anyhow, the bird inflicted a painful scalp wound, which was some days in healing.

## PALEORNIS VIBRISSA (Page 409).

In the Edinburgh Review for April, 1882, appears an article on 'The late Lord Tweeddale's Ornithological Essays,' which deserves a passing comment for the singular dishonesty it displays, in the brief allusion it indulges in of a naturalist who stands in the foremost rank of those who have made Indian Ornithology their study. The article in question is in fact a sustained eulogy of the deceased nobleman, and as such is admirable in its way; but when its author contrives by both a *suggestio falsi* and the *suppressio veri* to calumniate one of India's ablest naturalists, because, forsooth, he once wrote disparagingly of Lord Tweeddale, and in a strain (it may be admitted) of doubtful taste, it behoves all who do not wish to see the scandalous malignity which disgraces political controversy introduced into scientific discussion, to lift up their voice in protest.

The first passage which betrays the animosity of the writer to Mr. A. O. Hume is where, in alluding to his Lordship's first Memoir on Captain Beavan's collection of birds from British Burma, he says, "The birds of British Burma were not nearly so well known as they now are from the labours of Davison, Ramsay and Oates." To those familiar with Indian ornithology, the omission of the name of Mr. A. O. Hume (not to mention others) from a place among those who have worked out the ornithology of Burma, may simply excite laughter or contempt, but as the majority of readers of the Review are not versed in ornithological matters, the omission in question, all things considered, is simply dishonest, and that this omission is studied, and not accidental, is proved by the deliberate omission throughout the article of all mention of Mr. Hume's special claim to the gratitude of all interested in Indian ornithology, as editor and originator of 'Stray Feathers.'

Lord Tweeddale (as we all know) revised and edited the ornithological portion of Blyth's posthumously published Catalogue of the Mammals and Birds of Burma—good. But the reviewer adds, "This memoir (Blyth's memoir, be it remembered) is still the leading volume of reference on the birds of British Burma, though it is



likely to be superseded very shortly, we believe, by a new work on the subject by Mr. E. Oates." Now were my esteemed friend Mr. Blyth alive, I know he would be the first to disclaim all approval of this invidious praise, and the dishonesty involved, in the suppression in the above passage of even an allusion to Mr. Hume's work, *Stray Feathers*, which will ever stand as a mine of information, wherein the results of all the ornithological work done in Burma since Blyth's death are from time to time recorded. Here, again, the ornithological reader may smile, at the malice of an anonymous critic, but the omission, so far as the general reader is concerned, is an act of dishonesty injuriously directed against Mr. Hume.

Mr. Hume's name is first alluded to by the Reviewer as follows: "But about this time Lord Tweeddale's sympathies were excited by an unprovoked attack made by Mr. Allan Hume, an Indian amateur ornithologist, upon Dr. Finsch, one of the most learned and accomplished naturalists of the Fatherland." Now of all Indian ornithologists whom the reviewer mentions by name, and of the far larger number likewise of whom no mention is made, but two are not '*amateurs*.' To single out therefore Mr. Hume, and specially allude to him as an '*amateur*,' can only be done to insinuate that he is an amateur in some other sense than his colleagues, or in a word a bungler or some such term of disparagement. This I hold is a *suggestio falsi*, as I understand the meaning of that phrase. Alluding to Dr. Finsch's work on Parrots, the Reviewer goes on: "In 1874, *i.e.* six years after the publication of the second volume of the '*Mémoire*,' Mr. Hume took occasion to write a review of it, and *profiting* by the knowledge of the Indian species, which he had in the meantime acquired, and by some alleged inaccuracies of Dr. Finsch regarding them, proceeded to condemn the whole work in unmeasured terms, accusing the author of wanton and perverse ignorance, and gratuitous errors." Now the gist of this charge I hold to be absolutely false. In the opening<sup>1</sup> sentence of his review of "*Die Papageien*," Mr. Hume states that it was but recently that the work had come into his hands, and on the same page stands the following estimate of Dr. Finsch's work, an estimate no one would possibly suspect Mr. Hume of forming who had nothing to guide him but the garbled indications of the spiteful Reviewer: "As an Index of synonyms and a work of reference in regard to nomenclature, *Die Papageien* will always be most valuable. The minute and careful measurements and descriptions of every species, merit our cordial acknowledgment, whilst the industry and erudition, which has characterized Dr. Finsch's researches into all that has been recorded in regard to this fascinating family, compel our admiration, even if it excites a sadder feeling when we consider *how* he has utilized the materials he has thus accumulated."

With what decency can the writer of the above be charged with condemning "the whole work in unmeasured terms"?

What Mr. Hume did condemn with a righteous warmth, which no man need be ashamed to exhibit, may be gathered from the sentences immediately following the one quoted above.

"I have only, as already stated, scrutinized closely his treatment of the single well-known genus *Palaornis*; but this discloses an amount of error scarcely credible in such a work. Error, too, entirely gratuitous and created by the author himself, who never, probably, having seen a single wild bird belonging to the genus, chooses on hypothetical, and as a matter of fact, utterly untenable grounds, to disregard, nay, to pooh-pooh contemptuously, the recorded experience of men like Jerdon and Blyth, who for a long series of years observed the free living birds, shot and dissected them, and knew to a certainty, beyond all possibility of question, the facts that they stated. We are all liable to error, but for a cabinet naturalist, on the strength of half a dozen wrongly-sexed skins in some museum, to take upon himself to contradict the definite statements of trustworthy field-naturalists like those above referred to, in regard to matters of which he can personally know nothing, appears to me to indicate a tone of thought incompatible with the philosophical investigation of any branch of physical science."

<sup>1</sup> *Stray Feathers*, vol. ii. page 1.

This is, I think, enough to show the indefensible treatment Mr. Hume has received at the hands of his critic, but the matter is not without its humorous, as well as its graver aspect. Mr. Hume is charged with "being unacquainted with German," and with indulging himself in "a vulgar style of facetiousness, which is hardly suitable to scientific writing." In this there may be a residuum of truth, but as the critic in a note gravely points out that 'Finsch' is not equivalent to 'Finch' or 'Fringilla,' we have ample warrant for regarding him as belonging to that unhappy class of persons with whom a surgical operation is necessary before they are capable of recognizing a pun.

#### LORICULUS VERNALIS (Page 410).

"This (writes Dr. Mason) is one of the smallest birds of the parrot-tribe. Its child-like notes are among the most familiar sounds in the interior, during the declining day. Its Burman name signifies 'headlong,' from its habit of suspending itself from the tree head-foremost like a bat."

#### CELTS (Page 484).

Dr. Mason thus refers to the occurrence of Celts in Burma, both of stone and copper; but his views were somewhat confused on the subject, as is proved by the following amusing diatribe against those who hold them to indicate a greater age for the human species than that which is commonly assigned to it, by the so-called Mosaic chronology.

"According to our modern Moses, so soon as the monkeys had lost their tails, they went to work chipping flints to kill each other for food. This is proved by a certain savant of Portugal, who finds evidence that man once existed in that district, in so rude a condition that he lived in caves, ate human flesh, and possessed chipped flints for his sole weapons. This is called the 'old stone age,' the stones being in the rough. As man advanced in civilization, he polished his stones, and thus introduced 'the polished stone age.' Mr. Theobald, of the Geological Survey, in the Proceedings of the Asiatic Society of Bengal, for July, 1865, and again for July, 1869, first brought to public notice the existence of stone implements in Burma."

The following extracts are from the above-mentioned paper of 1869. "Excepting a short notice in the Proceedings for July, 1865, p. 126, nothing that I am aware of has been published respecting the stone implements found in Burma. They are, however, curious, as differing materially in form and type, not only from anything found in India, but from anything hitherto described from any part of Europe, though any implement yet found in India has its precise analogue in Europe.

"The material of which the Burmese implements are fashioned is either basalt, or some schistose rock, quite unlike anything to be met with in the district where the implements themselves occur; a fact pointing, in my opinion, to their having been brought down from Upper Burma (where these implements are said to be common) by the original settlers in the country. They are called '*mo-jio*,' or thunder-bolt, by the Burmese, and are believed to accompany the lightning. The popular idea is that, if a flash of lightning is seen to strike, and an earthen *chattie*, or other vessel, is inverted over the spot, in the course of a year or so, the *mo-jio* will be found in it, having worked its way back again to the surface by its own recoil.

"To the true '*mo-jio*,' the Burmese attach much value from the properties they believe it to possess, but they subject the articles to many tests, as, no doubt, from experience, they have discovered that many of them are in circulation, which, from *not possessing* the characteristic powers of the *mo-jio*, must therefore be spurious. I have not, however, myself seen more than one stone *mo-jio*, whose authenticity I doubted, and that mainly from its being made of jade; but though rare down here, authentic jade implements may be found in Upper Burma.

"One test of authenticity, the Burmese say, is that, if wrapped in a cloth and fired at, no effect will be produced on either the cloth, or its contents, however near the gun

may be held, and the true *mo-jio* is mainly valued from this belief in its presence producing invulnerability in the wearer. Another test is, placing the *mo-jio* on a mat with a quantity of rice. If a genuine stone from heaven, no fowls, or other creatures, will venture near the rice. Again, another test is cutting a rainbow in half; a feat quite within the power of any one possessing the real *mo-jio*. Or if he cuts down a plantain tree with one, the tree will be killed, and not, as is usually the case when cut down, send up a new shoot. It also guards from fire, which leaves untouched any house containing one. Its medicinal virtues too are believed to be very great, and a small chip reduced to powder and administered internally is considered as a cure against inflammation of the viscera and of the liver.

"The universal testimony of the Burmese goes to prove that these implements are picked up on the surface of the hills, in the fields or clearings made for cultivation, and I never heard of their being found in the plains or anywhere, save on the hill-sides, by the peasants engaged in clearing and cultivating them. This, I think, points to their accidental loss or abandonment by their original owners, in spots which supplied the wants of a long-passed generation, as they do the present race. Supposing, however, that the men who wrought these implements were ignorant of metal, or I may say iron, it is not easy to comprehend, how they were able to effect clearances, as the present race does, in the gigantic forests of Pegu; assuredly heavier and more difficult to cope with by feeble men then, than now, and without clearing the forest, no cultivation would be possible in its umbrageous recesses.

"On the question, then, whether the makers of these stone implements possessed iron also, depends, I think, the right determination of their use. If in possession of the means for clearing the hill-sides sufficiently for the cultivation of cereals, then I should incline to regard these stone relics as agricultural implements, used in hand agriculture, at the end of a stick, as a spade, to form the shallow holes in which the 'hill rice' is even now sown by the Karens and Burmese in their hill clearings. If not explained in this manner, we must then regard them as weapons of the chase and war, though this use is, I think, negatived by their thoroughly inefficient character for such purposes."

Since the above extract was written, Mr. Ball has discovered stone weapons of the 'shouldered' or Burmese type in India, near Jabalpur, and the Central Provinces.<sup>1</sup>

In the Indian Antiquary, November 1st, 1872, Dr. Mason thus describes some copper celts from Toung ngoo.

"In the Toung-ngoo district copper celts are not uncommon. They are sometimes little wedges of the same size and shape as the most common of the stone celts. One is 1·8 inches long by 1·7 broad, and 0·6 thick at the end; and weighs 10 tolas. It is bevelled down on both sides at the edge, and has evidently been cast in a mould, with, I think, some admixture of metal not copper.

"Another, but rarer form, is that of a small spade, cast with a hollow socket in which to insert a wooden handle, such as are used in cultivation by both Burmese and Karens, and other tribes of the present day, but made of iron. It is 3·2 inches long, by 1·7 wide at the broadest part.

"A third form is that of the hollow spearheads. The length is 4·4 inches hollow with a depth of 3·9, leaving 0·5 solid at the margin. The width of the broadest part is 3·2. Another spearhead of the same general outline, but smaller, with sharper barbs, and one larger than the other, was brought me by a Shàn, who said it came from the borders of China. It was 3·4 inches long, by 2·6 broad at the blade.

"Besides the form usually recognized as celts, the Karens associate with them a miscellaneous collection of circular articles both of stone and bronze. The most notable among them is a stone quoit, 4·3 inches in diameter, with a hollow in the centre 2·2 across, leaving the stone circle 1·1 broad; and which is 0·5 thick on the inner side, but is bevelled off to a sharp edge on the margin. I have heard of several specimens, but the one I examined is a fine polished instrument made of striped jasper."

<sup>1</sup> Ball's Jungle Life in India, Appendix B.

This 'quoit' is really an 'anklet' or 'bangle,' like that figured in *Memoirs Geological Survey of India*, vol. x. pl. vii. Dr. Mason goes on to add:

"It will not be disputed but the celts of Burma have the *form* of pre-historic implements, but all I have seen appear to me of comparatively modern manufacture, and I think Mr. Theobald, who knows most about them, is of the same opinion. The natives say they are picked up in the streams, or found on the mountain sides, or dug out of the ground, but their representations are utterly untrustworthy and deserve no more credence than their assertions that they came down originally from heaven with the lightning, or that they have power to cure disease."

To avoid misconception here, I may say that I told Dr. Mason that not improbably 'celts' were still manufactured, especially from jade, in Upper Burma, for sale; but I nowise intended to convey any doubt of the genuine and archaic character of the models which these modern celts were intended to imitate. As for Dr. Mason's very disparaging estimate of native testimony, it is, to say truth, based on prejudice. I can only say that the very large weapon figured in pl. iii. vol. x. *Memoirs Geological Survey of India*, was picked up in a wild mountain stream by a servant of mine, in my presence, and such is no doubt the way that all genuine celts are now-a-days found. Dr. Mason goes on to add:

"But supposing, for the sake of argument, that these spades and hoes were formerly used in Burma for agricultural purposes, their use necessitated the existence of means to cut down trees, and clear the forest, and, therefore, of iron instruments, for all the celts in Burma would not cut down a single teak tree; so we are forced to the conclusion that these stone and copper implements co-existed with iron, when we may suppose iron was scarce, and not sufficiently abundant for all purposes; a state of things which it is not necessary to go down to below zero in the Mosaic chronology to find.

"Not many days' walk from Balmora, where the Queen eats off gold and silver, I have seen, in the latter half of the nineteenth century people dining on wooden dishes. Now were these people, with their wooden platters in the pantry, sunk by a sudden catastrophe into the mud of the lake by which they dwell, they might, before the century closes, be dug up again a veritable 'cran-nog,' and by the reasoning now applied to celts, it might be proven that they lived in a 'wooden age' before crockery was known.

"Many people stand masticating the truths of the Bible as an ox does his fodder, lest they should incontinently swallow a myth, but at sight of such trumpery shams as these Hindu and Chinese 'Brummagem' wares, they instantly read us marvellous dissertations on pre-historic times, long before Moses was born or thought of, on this wise—'These stone instruments clearly prove that there was a period in pre-historic times when the Burmese or the inhabitants of Burma, of whatever race they were, were wholly unacquainted with the arts of fabricating iron, steel, and metal instruments for cutting, and they resorted to the more difficult work of fashioning stone into adzes and axes, and other cutting instruments.'—*Credat Judeus Apella, non ego.*"

It is needless, however, to pursue the subject, or point out how untenable Dr. Mason's views are, as the authenticity of stone weapons as a class is quite beyond challenge, though the particular uses to which many of them were put may be open to question. Equally certain is it, that although stone weapons may still be used by barbarous tribes in out-of-the-way nooks and corners of the world even at the present day, yet identical or similar weapons were used by our savage forefathers in war and the chase, and in their domestic life, at a period long before the dawn of history, either sacred or profane, and when the Mammoth and Cave-bear, and other extinct contemporaries of those animals still wandered over Europe (England included), and shared the dominion of the wild with man himself.

## APPENDIX B.

### LIST OF BURMESE VERNACULAR NAMES.

THE present list of vernacular names is compiled mainly from Dr. Mason's list, with numerous additions from other sources; but for its accuracy I must disclaim any responsibility, from the fact that I have an extremely slender acquaintance, even colloquially, with the Burmese language. In compiling it, however, I have been most efficiently aided by Mr. Alfred Hough, of the Burmese Commission, to whom is really due whatever credit attaches to the work. But the difficulty in preparing a trustworthy list is after all not so much in finding a competent translator as in the subject-matter itself.

For certain well-known species of animals and plants there are no doubt names as fixed in the vernacular as in scientific language, but these are few compared with the host of species differentiated by science; and to affect to find out and bestow vernacular names on the numberless species due to modern scientific research, is to simply perpetrate a sham. The idea that every species, or even the majority of species, possesses a vernacular name, is an absurdity. As an instance of the length to which this hankering after vernacular names is carried, there are actually given in the earlier edition (of 1860, p. 734) distinct vernacular names for the six varieties of Tourmaline enumerated, *white, red, yellow, green, black*, and the *decoloured* stone; though it may safely be affirmed that there are not half a dozen Burmese-speaking men of any race throughout the world who could discriminate by their properties one Tourmaline from another, or from similarly coloured stones. This is an extreme instance and example of manufacturing vernacular names by translating the English word into Burmese, when the idea which the word represents has no existence in the minds of the men speaking the language. Excising then all the misbegotten vernacular names of this stamp, we have still a large number to deal with which are objectionable on other grounds. In Burmese, as in English, there are many names which are applied loosely (so to say) to many different animals—some which apply generically, and some which apply more loosely still. For example, Ngā-sin-hpyu is applied to *Systomus*, *Leuciscus*, and *Opsarion* (i.e. p. 698), and is clearly applicable to any white-looking little fish resembling the members of those genera, and has really no proper reference to any one particular species; and this comprehensive vagueness in the application of a vernacular name may be said to be the rule, in a greater or less degree, with the majority of them. An equally pregnant example is afforded by the vernacular name for a Snipe, Mye-wôt, which also stands for a bird utterly dissimilar and unlike in appearance, the Goatsucker, the idea attaching in the mind of a Burman being that of "crouching on the earth," which both the Snipe and the Goatsucker habitually do, and hence go by one and the same name.

The list now given is divided into columns, the first giving the Burmese name in the Roman character, and the second column its scientific equivalent.

The names in the first column are spelt phonetically, and are not transliterations of the Burmese words. To pronounce them, therefore, properly, attention must be paid to the simple rules which have been adopted; but, unfortunately, where the names have been copied from Kurz or other authors, who give neither the name in the vernacular character, nor a standard whereby it can be pronounced, it is not

possible, from the variable and inconstant practice of English spelling and pronunciation, to tell, where the word is not known or familiar, what is the pronunciation intended. The name 'Tenasserim' may be instanced as a case in point, how vernacular names become metamorphosed when transliterated or otherwise rendered into English by men unacquainted with Burmese, as the familiar 'Tenasserim' is no other, properly speaking, than 'Ta-myen-tha-ra-kyēn,' or Ta-nen-tha-ri-kyeing, a species of calamus common in that Province. Many of the names, therefore, are open to correction, and the list is merely given for what it is worth, and invites correction from those in a position to do so.

I have intentionally eschewed the solecism (which so mars the appearance of the British Burma Gazetteer) of spelling Burmese words with an "r" in place of a "y," though the inability of the Burmese to pronounce the letter 'r' is well known, and is a veritable '*shibboleth*' to the people of Burma (exclusive of Arakan), as it is with the Chinese. However convinced scholars may be that the Burmese *should* pronounce their 'r's, that letter can find no place in any attempt to reproduce phonetically the language as spoken.

The following simple rules must be attended to in pronouncing the name in the Roman character:—

The vowels *a, e* and *o* are always short, save where marked as long. The vowels *i* and *u* are always long: *y* stands in place of the short *i*: *g* is always hard, and *j* like a soft *g*. For example:

ā in maji	as <i>a</i> in <i>america</i> .	y in thyt as <i>y</i> in <i>syncope</i> or
ā ,, ngā	,, <i>a</i> ,, <i>father</i> .	<i>i</i> in <i>sān</i> .
e ,, huet	,, <i>e</i> ,, <i>net</i> .	o ,, tor ,, <i>o</i> ,, <i>pot</i> .
ē ,, yē	,, <i>a</i> ,, <i>same</i> .	ō ,, bōk ,, <i>o</i> ,, <i>popc</i> .
i ,, mijoung	,, <i>i</i> ,, <i>piano</i> .	u ,, lu ,, <i>u</i> ,, <i>supreme</i> .

The following words being in frequent use in composition, are given together with their signification.

Ben or Byn, a tree.	Khyoung, a stream.	Myouk, a monkey.	Shor, slide.
Bō, male.	Kyonug, a cat.	Ngā, fish.	Thyt, wood.
Mā, female.	Kha-u, a shell.	Ngo, a cry.	Tanyet, sugar.
Hmā, hard.	Khwē, a dog.	Ngu, a green pigeon.	Tor, wild.
Goung, head.	Kyu-weh, a buffalo.	Nadoung, an earring.	Toung, hill.
Galē, small.	Kyan, a rhinoceros.	Nyo, blue.	Thwē, blood.
Gyi, large.	Kyān, sugar-cane.	Ni, red.	Thamen, the Panolia.
Net, black.	Kyē, a parrot.	Nwel, a creeper.	Tsek, a goat.
Hnet, a bird.	Kyet, a hen.	Pyn or byn, a tree.	Wā, { yellow, or a
Hpyu, white.	Kyouk, a stone.	Pōk or bōk, stinking.	{ bamboo.
Hpā, a frog.	Lēk or } a tortoise.	Pyn-leh, sea.	Wet, a hog.
Hsyn, an elephant.	Leik, }	Pyān or byān, flying.	Wūn, a bear.
Jio, a dove.	Lu, a man.	Sēng, green.	Yō, a bone.
Kyā, a tiger.	Myē, earth.	Sā, food.	Yē, water.
Khoun, hollow.	Mywē, a snake.	Shwē, gold.	
A-pyaik-net . . . . .	<i>Schorl</i> . . . . .		Black tourmaline.
Aw-yaw . . . . .	<i>Graculus</i> . . . . .		Cormorant.
Ba-shu-ngā . . . . .	<i>Alosa toli</i> . . . . .		Malay shad.
Bōk . . . . .	<i>Centropus intermedius</i> . . . . .		Crow-pheasant.
Bahān-kyouk . . . . .			Iron pyrites.
Bōng-ma-dī . . . . .	<i>Carpophaga</i> . . . . .		Fruit pigeon.
Bu-yit . . . . .	<i>Dolium</i> . . . . .		Tun shell.
By-aing . . . . .	<i>Ardea</i> . . . . .		Heron.
By-aing-hpyu . . . . .	<i>Herodias</i> . . . . .		Egret, or white paddy bird.
By-aing-ouk . . . . .	<i>Ardeola Grayi</i> . . . . .		Brown paddy bird.
Chā . . . . .	<i>Termes</i> . . . . .		White ant.
Chā-bō . . . . .	<i>Cimex lectularius</i> . . . . .		Bed bug.
Chyn, or Khyen . . . . .			Mosquito.

Darch . . . . .	<i>Hyelaphus porcinus</i> . . . . .	Hog deer.
Den-gyi . . . . .	<i>Plotus</i> . . . . .	Snake bird.
Di-dök . . . . .	<i>Bubo</i> . . . . .	Eagle owl.
Dōng-sāt . . . . .	<i>Leptoptilos argala</i> . . . . .	Adjutant.
Dōng-mye-kwet . . . . .	<i>Leptoptilos javanica</i> . . . . .	Lesser adjutant.
Doung . . . . .	<i>Pavo muticus</i> . . . . .	Burmese pea-fowl.
Doung-ka-lā . . . . .	<i>Polyplectron chinquis</i> . . . . .	Argus-pheasant.
Doung-tswōn . . . . .	<i>Spilornis cheela</i> .	
Doung-u-hnouk . . . . .	<i>Huear caerulescens</i> . . . . .	Pignay falcon.
Eyng-hmyoung . . . . .	<i>Hemidactylus</i> . . . . .	House lizard.
Eyng-sā . . . . .	<i>Passer</i> . . . . .	House sparrow.
Ganān . . . . .	. . . . .	Crab (generic).
Ganān-ltch . . . . .		
Ganān-myen zaing . . . . .	<i>Ocypoda cecatophthalma</i> .	
Gor-dan . . . . .	. . . . .	Quartz.
Gyen . . . . .	<i>Arca</i> . . . . .	
Gyi . . . . .	<i>Cervulus</i> . . . . .	Barking deer.
Heng-thā . . . . .	<i>Casarea rutila</i> . . . . .	Bradmince duck.
Hmwā . . . . .	. . . . .	Tick.
Hmwā-goung . . . . .		
Hmyaw . . . . .	<i>Hirudo</i> . . . . .	Water leech.
Hnān-boung . . . . .	<i>Mantes</i> . . . . .	Leaf-insect.
Hnān-pyi-sök . . . . .	<i>Orthotomus</i> . . . . .	Tailor bird.
Hnet-daw . . . . .	<i>Dicurus</i> . . . . .	King-crow.
Hnet-kā . . . . .	<i>Coracias affinis</i> . . . . .	Burmese roller.
Hnet-men-thā . . . . .	<i>Perichrotus</i> (male) . . . . .	The Cardinal.
Hnet-men-thā mi . . . . .	<i>Perichrotus</i> (female).	
Hnet-nwā . . . . .	<i>Nycticorax griseus</i> . . . . .	Night heron.
Hnet-pa-dōng . . . . .	<i>Megalaima haemacephala</i> . . . . .	Barbet.
Hnet-pa-zin-hto . . . . .	<i>Mrops</i> . . . . .	Bee-eater.
Hnet-sēng . . . . .	<i>Phyllorhis</i> . . . . .	Green orioles.
Hnet-wā . . . . .	<i>Oriolus</i> . . . . .	Mango birds.
Hpā . . . . .	<i>Rana</i> . . . . .	Frog.
Hpā-pyök . . . . .	<i>Bufo</i> . . . . .	Toad.
Hpā-hi-khā . . . . .	<i>Leuciscus</i> . . . . .	Tavoy white-fish.
Hpan-kyouk . . . . .	. . . . .	Rock crystal.
Hpwōt-mi-joung . . . . .	<i>Hydrosaurus salvator</i> . . . . .	Monitor.
Hpwōt . . . . .	<i>Varanus</i> . . . . .	Scavenger lizard.
Hpyök . . . . .	. . . . .	Sand fly.
Hpyn . . . . .	<i>Hystrix</i> . . . . .	Porcupine.
Hypu-yōng . . . . .	<i>Lepus</i> . . . . .	Hare. Rabbit.
Hsāt (see Tsāt)		
Hsyn . . . . .	<i>Elephas indicus</i> . . . . .	Indian elephant.
Hsyn-hmyaw . . . . .	<i>Holothuria</i> . . . . .	Sea slug. Trepang.
Hsyn-pēng-nyin . . . . .	<i>Pelargopsis amauroptera</i> .	
Hsyn-pō . . . . .	. . . . .	Locust.
Htōk-tā-ru . . . . .	<i>Harpactes</i> .	
Jio . . . . .	<i>Turtur</i> . . . . .	Dove.
Jio-nyo . . . . .	<i>Chalcophaps</i> . . . . .	Bronze-winged dove.
Jio-jyā . . . . .	<i>Grus antigone</i> . . . . .	Crane.
Jyat-long . . . . .	<i>Hydrophis</i> . . . . .	Sea-snake.
Jio-thēng . . . . .	<i>Timonculus</i> .	
Jyat-byā . . . . .	<i>Hydrophis</i> . . . . .	Sea-snake.
Ka-bōng-thā . . . . .	<i>Modiola</i> .	
Ka-ku-yān . . . . .	<i>Polygmus indicus</i> . . . . .	King-fish.
Ka-lā-gouk . . . . .	<i>Ibis melanocepalus</i> .	
Ka-loung-boung . . . . .	<i>Sciæna miles</i> .	
Ka-lu-kwet . . . . .	<i>Gallinula phenicura</i> . . . . .	Water-hen.

Ka-mā . . . . .	<i>Ostrea</i> . . . . .	Oyster.
Ka-mā-kha-yen . . . . .	<i>Perna</i> .	
Ka-meh . . . . .	<i>Solecurtus</i> .	
Kān-gu . . . . .	<i>Shatite</i> . . . . .	Burmese pencil stone.
Kā-tha-hō . . . . .	<i>Gobius kokins</i> .	
Kā-tha-boung . . . . .	<i>Eutropichthys iacha</i> .	
Khai-tha-dā } . . . . .	<i>Loriculus vernalis</i> . . .	Parrakeet or Lory.
Khā . . . . .	<i>Perdix coturnix</i> . . .	Quail. Partridge.
Khā-yu-sōk . . . . .	<i>Anastomus oscitans</i> . . .	Shell-eater.
Kha-yu-gamān . . . . .	<i>Pterocera</i> . . . . .	Scorpion shells.
Kha-yu-huā-moung laing . . . . .	<i>Spirula</i> .	
Kha-yu-hsen huā-moung . . . . .	<i>Hiatula diplos</i> . . . . .	Purple diphos.
Kha-yu-ka-dōng . . . . .	<i>Cerithium obtusum</i> .	
Kha-yu-kyouk-mouk . . . . .	<i>Pholas Lithodomus</i> . . .	Boring shells.
Kha-yu-ka-wet-toung . . . . .	<i>Pyrula</i> . . . . .	Fig shells.
Kha-yu-myek-lōng . . . . .	<i>Natica</i> . . . . .	Natica.
Kha-yu-men-sā . . . . .	<i>Tellina</i> . . . . .	Tellens.
Kha-yu-ō-zī . . . . .	<i>Melania</i> . . . . .	Melantias.
Kha-yu-nāt-sā . . . . .	<i>Nucula</i> . . . . .	Nucula.
Kha-yu-pōk . . . . .	<i>Planorbis</i> . . . . .	Coiled pond snail.
Kha-yu-tha-pi . . . . .	<i>Nautilus</i> . . . . .	Nautilus.
Kha-yu-thān-gyi . . . . .	<i>Pyrula</i> . . . . .	Fig shells.
Kha-yu-thah-pa-lito . . . . .	<i>Olivra</i> . . . . .	Olive shells.
Kha-yu-thyt-pen-tet . . . . .	<i>Columbella</i> . . . . .	Columbella.
Kha-yu-yā . . . . .	<i>Paludina</i> . . . . .	Operculated pond snail.
Kha-yu-yā-gyi . . . . .	<i>Ampullaria</i> . . . . .	Apple shell.
Kha-yu-yā-pen-lē . . . . .	<i>Natica. Rotella</i> .	
Kha-yu-zī-zyn . . . . .	<i>Melania</i> .	
Kha-yen . . . . .	<i>Balanus</i> . . . . .	Barnacle.
Khch-nct . . . . .	<i>Plumbago</i> . . . . .	Black-lead.
Khch-mā-hpyu . . . . .	. . . . .	Tin.
Khen-pōk } . . . . .	<i>Ninox hirsutus</i> .	
Khin-bōk } . . . . .		
Khen-chyē-myē . . . . .	<i>Scolopendra</i> . . . . .	Centipede.
Khen-myi-kouk . . . . .	<i>Scorpio</i> . . . . .	Scorpion.
Khō . . . . .	<i>Alsocomus. Columba</i> . . .	Pigeons.
Khu . . . . .	<i>Medusa</i> . . . . .	Jelly fish.
Khwē . . . . .	<i>Canis</i> . . . . .	Dog.
Khwē-ta-wet-wet-ta-wet . . . . .	<i>Arctonyx collaris</i> .	
Khwē-lē . . . . .	. . . . .	Dog flea.
Khwē-lē-pyā . . . . .	<i>Tabanus</i> . . . . .	Dog-flea-bee.
Kōk-kha loung . . . . .	<i>Megalaima</i> . . . . .	Barbets.
Kun-shāt . . . . .	<i>Cymbium guttatum</i> .	
Kweh . . . . .	<i>Trigona lariceps</i> . . . . .	Dammar bee.
Kyā . . . . .	<i>Felis tigris</i> . . . . .	Tiger.
Kyā-let-thch . . . . .	<i>Iridacna</i> . . . . .	Giant clam.
Kyā-thyt . . . . .	<i>Felis pardus</i> . . . . .	Leopard or tree tiger.
Kyan . . . . .	<i>Rhinoceros Sumatrensis</i> . .	Two-horned rhinoceros.
Kyan-goung } . . . . .	<i>Rhinoceros Soudaicus</i> . .	{ Lesser one-horned
Kyan-hsyn } . . . . .		rhinoceros.
Kyet-daw } . . . . .	<i>Palæornis cupatrius</i> . . .	Green parrot.
Kyē-hpoung-khā } . . . . .		
Kyē-gyōk . . . . .	<i>Palæornis torquatus</i> . . .	Ring-necked parrot.
Kyē-kalū } . . . . .	<i>Palæornis cyanocephus</i> . . .	Blue-headed parrot.
Kay-tamā } . . . . .		
Kyet-hsyn . . . . .	<i>Meleagris gallo-paro</i> . . .	Domestic turkey.
Kyet-tu-ywē . . . . .	<i>Palæornis</i> . . . . .	Parrots.



Kyet or Tor-kyet . . . .	<i>Gallus ferrugineus</i> . . .	Jungle fowl.
Kyi-gan . . . . .	<i>Corvus</i> . . . . .	Crow.
Kyounk-mā-lu ( )		
Kyounk-ngā-lu ( )	<i>Labeo boga</i> .	
Kyounk-mi-thwē . . . . .		Coal.
Kyounk-ni . . . . .		Ruby.
Kyounk-pyn-wun . . . . .	<i>Mytilus</i> . . . . .	Mussel.
Kyounk-than-sweh . . . . .		Loudstone.
Kyweh . . . . .	<i>Bubalus</i> . . . . .	Buffalo.
Kyweh-zā-yet . . . . .	<i>Sturnopastor contra</i> . . .	Buffalo. Mynah.
Ky-wē-pōk . . . . .	<i>Olea</i> . . . . .	Olive shell.
Kyoung . . . . .	<i>Felis domestica</i> . . . . .	House cat.
Kyoung-ka-dō . . . . .	<i>Viverra Malaccensis</i> . . .	Malacca civet.
Kyoung ma-sā . . . . .	<i>Ambassis nalu</i> .	
Kyoung-myin . . . . .	<i>Viverra zibotha</i> . . . . .	Civet cat.
Kyoung-na-ywet-hpyu . . . . .	<i>Paradorurus leucotis</i> .	
Kyoung-baik . . . . .	<i>Paradorurus masanga</i> .	
Kyoung-pyan . . . . .	<i>Helictis Nipalensis</i> .	
Kyoung-thyt . . . . .	<i>Felis undata</i> . . . . .	Leopard cats.
Kywet-sōk . . . . .	<i>Sorex</i> . . . . .	Musk-shrew.
Kywōt . . . . .		Land leech.
Kywōt-wun-hpyu . . . . .	<i>Mus</i> . . . . .	White-bellied rats.
Lāk-wā (?)		
Kweh-yen (Tavoy) }	<i>Polynemus indicus</i> . . .	King fish
Lēh-jyā . . . . .	<i>Pratincola caprata</i> .	
Lēk-pyā . . . . .	<i>Papilio</i> . . . . .	Butterfly.
Lān . . . . .	<i>Limulus</i> . . . . .	King-crab.
Lē-khye . . . . .	<i>Mica</i> . . . . .	Muscovy glass.
Lēh-pazwōn . . . . .		
Lēh-kha-yu . . . . .	<i>Ampullaria</i> . . . . .	Apple shell.
Lēk-goung-gyi . . . . .	<i>Testudo platynotus</i> . . .	Pegu land-tortoise.
Lēk-pyin-wun . . . . .	<i>Chelonia virgata</i> . . . . .	Sea turtle.
Lyn-miwe . . . . .	<i>Ptyas mucosus</i> . . . . .	Paddy field snake.
Lyn-baing . . . . .	<i>Orcella</i> . . . . .	Porpoises.
Lyn-tweh . . . . .	<i>Pteropus medius</i> . . . . .	Flying fox.
Lyn-wet . . . . .	<i>Nycticorax</i> . . . . .	Night heron.
Lyn-ta . . . . .	<i>Gyps</i> . . . . .	Vulture.
Mēn-doung . . . . .	<i>Polyplectron chinquis</i> . . .	Argus pheasant.
Mēn-mā-let-thieh . . . . .	<i>Numenius phaeopus</i> . . .	Whimbrel.
Mi-joung . . . . .	<i>Crocodilus</i> . . . . .	Crocodile.
Mō-goung-hnet . . . . .	<i>Eurystomus orientalis</i> . . .	Broad-bill.
Mōk-sck-hnet . . . . .	<i>Hirundo</i> . . . . .	Swallow.
Myain-sēng . . . . .		Rock crystal.
Myē-kōng }		
Myē-ngong }	<i>Pitta</i> . . . . .	Ground thrush.
Myai-young }		
Myē-kywet . . . . .	<i>Mus</i> . . . . .	Ground rats.
Myē-ngouk }		
Myē-nyoung }	<i>Budytes Moluccellis</i> . . .	Wagtails.
Myē-wōt . . . . .	<i>Caprimulgus. Scolopax</i> .	Goatsucker. Snipe.
Myin . . . . .	<i>Equus</i> . . . . .	Horse.
Myit-twē . . . . .	<i>Sterna</i> . . . . .	Sea-swallows.
Myouk-hlweh-kyaw . . . . .	<i>Hyllobates</i> . . . . .	Gibbon.
Myouk-kyā . . . . .	<i>Arctictis Binturong</i> . . .	Monkey-tiger.
Myouk-moung-mā . . . . .	<i>Nycticebus tardigradus</i> . .	Monkey's concubine.
Myouk-myet-kwyn-hpyu . . . . .	<i>Semnopithecus obscurus</i> .	
Myouk-ni . . . . .	<i>Macacus leoninus</i> .	
Myouk-pa-di . . . . .	<i>Macacus nemestrinus</i> .	

Myouk-ta-ngā . . . . .	<i>Mucous epomolgus.</i>	
Mywē-houk . . . . .	<i>Naja tripudians.</i>	
Mywē-hsyu-pyat . . . . .	<i>Typhlops</i> . . . . .	Blind worm.
Mywē-pā . . . . .	<i>Ura cancrivora.</i>	
Mywē-seing . . . . .	<i>Trimacrus.</i>	
Nā-gā-goung . . . . .	<i>Morus.</i>	
Nat-ka-dor . . . . .	<i>Johias chapuis.</i>	
Ngā-aik . . . . .	<i>Macromis mi ophthalmus.</i>	
Ngā-ain (Arakan) . . . . .	<i>Ophiocephalus punctatus.</i>	
Ngā-bāt . . . . .	<i>Wallago attu.</i>	
Ngā-hpyu-reng-gyi (Arakan) . . . . .	<i>Platycephalus insidiator.</i>	
Ngā-bu-dyn . . . . .	<i>Xenopterus naritus.</i>	
Ngā-byā . . . . .	{ <i>Platygyaster affinis.</i> <i>Ambassis nalu.</i>	
Ngā-byē-mā . . . . .	<i>Anabas scandens</i> . . . . .	Climbing perch.
Ngā-byit . . . . .	<i>Sciaenoides pama.</i>	
Ngā-chong . . . . .	<i>Barbus sarara.</i>	
Ngā-chyn-myet-si-ni . . . . .	<i>Gobius.</i>	
Ngā-dān . . . . .	<i>Siluridae</i> . . . . .	Cat-fish.
Ngā-dēng . . . . .	{ <i>Labeo gonius.</i>	
Ngā-dyn . . . . .	<i>Rasbora daniconius</i>	
Ngā-doung-zi . . . . .	{ <i>Luciscus.</i> <i>Systomus.</i> <i>Opsarion.</i>	
Ngā-zin-hpyu . . . . .	<i>Arius Barmanicus.</i>	
Ngā-young . . . . .	<i>Scomber microlepidotus.</i>	
Ngā-goung . . . . .	<i>Cirrhitina mrigala.</i>	
Ngā-goung-gyi . . . . .	<i>Chatodon pictus.</i>	
Ngā-gyn . . . . .	<i>Saccobranchus fossilis.</i>	
Ngā-gyeng-kyouk . . . . .	<i>Macromis aor.</i>	
Ngā-gyi . . . . .	<i>Chatodon melanotus.</i>	
Ngā-gyoung . . . . .	<i>Amblypharyngodon Atkinsonii.</i>	
Ngā-hpā-kheh . . . . .	<i>Rohitee Belangeri.</i>	
Ngā-hpān-mā . . . . .	<i>Notopterus kafirat.</i>	
Ngā-hpeh onng . . . . .	<i>Aspidoparia morar.</i>	
Ngā-hpeh . . . . .	<i>Belone canila.</i>	
Ngā-hpen-bu . . . . .	<i>Perilampus atpar.</i>	
Ngā-hpoung-yo . . . . .	<i>Platycephalus insidiator.</i>	
Ngā-hpyin-gyan . . . . .	<i>Balanoptera</i> . . . . .	Whale.
Ngā-hpyu reng-gyi . . . . .	<i>Drepane punctata.</i>	
Ngā-hsyn . . . . .	<i>Rita Buchanani.</i>	
Ngā-hsyn-nē . . . . .	<i>Labeo gonius.</i>	
Ngā-litwē . . . . .	<i>Lystomus.</i>	
Ngā-hu . . . . .	<i>Mugilis.</i>	
Ngā-jyu-souk . . . . .	{ <i>Lates calcarifer.</i> . . . .	'Cockup.' 'Bhekti.'
Ngā-kā-ba-lu . . . . .	<i>Barbus chola.</i>	
Ngā-kā-ka-dyt . . . . .	{ <i>Ambassis baculis.</i> <i>Barbus stigma.</i>	
Ngā-ka-tha-boung . . . . .	<i>Barbus sarara.</i>	
Ngā-ka-tha myin . . . . .	<i>Systomus.</i>	
Ngā-khong . . . . .	<i>Synaptura Commersoniana.</i>	
Ngā-khong-mā . . . . .	<i>Rhombus maximus.</i>	
Ngā-khōng-mā-gyi . . . . .	<i>Clarias magar.</i>	
Ngā-khōng-bik-thā . . . . .	<i>Chela sardinella.</i>	
Ngā-khōng-kyān-ywet . . . . .		
Ngā-khwē-thū . . . . .		
Ngā-khwē-thā-pyin-wet . . . . .		
Ngā-ku . . . . .		
Ngā-kwon-hnyat . . . . .		

Ngā-kyā . . . . .	<i>Datnoides pulata</i> .	
Ngā-kyā-mā . . . . .	<i>Tocotes micropis</i> .	
Ngā-kyin . . . . .	<i>Cirrhia marginata</i> .	
Ngā-kyouk-hpā . . . . .	<i>Eretistes kara</i> .	
Ngā-kyoung-mā-sā . . . . .	<i>Ambassis naba</i> .	
Ngā-la-wā . . . . .	<i>Bardias guttatus</i> .	
Ngā-leh . . . . .	<i>Osteohilus chalybeatus</i> .	
Ngā-leh-hpyu . . . . .	<i>Amblypharyngodon naba</i> .	
Ngā-lē-toung . . . . .	<i>Barbas apogon</i> .	
Ngā-lu . . . . .	<i>Labo anga</i> .	
Ngā-lēk-kyouk . . . . .	<i>Rhinobates granulatus</i> .	
Ngā-lēk-pyā . . . . .	<i>Holacanthus aculeatus</i> .	
Ngā-lōn-bān . . . . .	<i>Anguilla bicolor</i> .	
Ngā-lōng . . . . .	<i>Mogil subciralis</i> .	
Ngā-lowah . . . . .	<i>Bichas chola</i> .	
Ngā-lēk-pyā . . . . .	<i>Holacanthus aculeatus</i> .	
Ngā-mān-haing . . . . .	<i>Rhinobates granulatus</i> .	
Ngā-mān-dor . . . . .	<i>Perilampus atpar</i> .	
Ngā-mān-kyor . . . . .	<i>Squalus tigrinus</i> .	
Ngā-mān-kywch . . . . .	<i>Zygana Bleekii</i> .	
Ngā-mi-loung . . . . .	{ <i>Perilampus lambuca</i> .	
	{ <i>Batis Buchananii</i> .	
Ngā-mu . . . . .	<i>Stromateus sinensis</i> .	
Ngā-myeu-kōn-bān . . . . .	<i>Eutropichthys cacha</i> .	
Ngā-myi-meh . . . . .	<i>Syngnatus</i> .	
Ngā-myit-chyn . . . . .	{ <i>Labo rubra</i> .	
Ngā-myit-tsun-mi . . . . .		
Ngā-mywē-do . . . . .	<i>Rhynchobdella ovalata</i> .	
Ngā-mywē-do-wet-toung . . . . .	<i>Mastacanthus zebraus</i> .	
Ngān . . . . .	<i>Naja claps</i> . . . . .	Hamadryad.
Ngā-nan-gyoung . . . . .	<i>Goputa cernia</i> .	
Ngā-na-thān . . . . .	<i>Callichrous macrophthalmus</i> .	
Ngān-dor-gya . . . . .	{ <i>Bangarus fasciatus</i> .	
Ngān-wā . . . . .		
Ngā-nek-kyā . . . . .	<i>Rohu Bholngri</i> .	
Ngā-nek-pyā . . . . .	<i>Labo calbasu</i> .	
Ngā-ni-pyā . . . . .	<i>Labo nandina</i> .	
Ngā-nouk-thwā . . . . .	<i>Macrones leucophasis</i> .	
Ngān-pōk . . . . .	<i>Naja claps</i> .	
Ngān-thān-gwyn-zōk . . . . .	<i>Bangarus fasciatus</i> .	
Ngā-ong-dōng . . . . .	{ <i>Labo calbasu</i> .	
	{ <i>L. nandina</i> .	
Ngā-pa-ni . . . . .	<i>Lutianus Johnii</i> .	
Ngā-pe (?) . . . . .	<i>Labo goniis</i> .	
Ngā-pā-moung . . . . .	<i>Stromateus nigr.</i>	Pomfret.
Ngā-pā-thwōn . . . . .	<i>Scatophagus Argus</i> .	
Ngā-pā-zwōn . . . . .	<i>Psillus argenteus</i> .	
Ngā-pan-ma . . . . .	<i>Amblypharyngodon Atkinsonii</i> .	
Ngā-phoung-yo . . . . .	<i>Hemiramphus ectunctio</i> .	
Ngā-pi-mā . . . . .	<i>Equula edentula</i> .	
Ngā-pong-nā . . . . .	<i>Polynemus paradiseus</i> . . . . .	Mango-fish.
Ngā-pet-lek . . . . .	<i>Macrones leucophasis</i> .	
Ngā-pēng-neh-sē . . . . .	<i>Clupea longipis</i> .	
Ngā-pōk-thyn . . . . .	<i>Sciana entor</i> .	
Ngā-poung-yo . . . . .	<i>Belone canela</i> .	
Ngā-prōn-ka (Arakan) . . . . .	<i>Teuthis</i> .	
Ngā-pu-zwōn . . . . .	<i>Psillus argenteus</i> .	
Ngā-pyān . . . . .	<i>Exocoetis nigripinnis</i> . . . . .	Flying fish.

Ngā-pyēk . . . . .	{ <i>Caranx lysan</i> .	
Ngā-pyn-thaik-konk . . . . .	<i>Sciaenoides pama</i> . . . . .	Whiting.
Ngā-rui (?) (Arakan) . . . . .	<i>Trichogaster fasciatus</i> .	
Ngā-sa-bā-sā . . . . .	<i>Sillago sihama</i> .	
Ngā-sa-ki (Arakan) . . . . .	<i>Therapon jarbua</i> .	
Ngā-shin . . . . .	<i>Hoplostichus panchax</i> .	
Ngā-shin-ni . . . . .	<i>Pneumobranchus</i> .	
Ngā-shu-gyi . . . . .	<i>Amphipneus euchia</i> .	
Ngā-shyn-ni . . . . .	<i>Platycephalus insidiator</i> .	
Ngā-ta-dum . . . . .	<i>Drepane punctata</i> .	
Ngā-tan-ywet . . . . .	<i>Sciaen coitor</i> .	
Ngā-ta-klwōn-klā . . . . .	<i>Megalops cyprinoides</i> .	
Ngā-ta-si . . . . .	<i>Trichiurus haumela</i> .	
Ngā-tat-weh . . . . .	<i>Barbus apogon</i> .	
Ngā-ta-yaw . . . . .	<i>Pristis</i> . . . . .	Saw-fish.
Ngā-tha-bōk . . . . .	<i>Polynemus tetradactylus</i> .	
Ngā-thaing . . . . .	<i>Gobius giurus</i> .	
Ngā-tha-leh-tō . . . . .	<i>Cutta Buchananii</i> .	
Ngā-tha-louk . . . . .	{ <i>Lepidocephalichthys Berdmorci</i> .	
Ngā-theh-tō . . . . .	<i>Acanthopsis choirochynchus</i> .	
Ngā-then-bor-pouk . . . . .	<i>Chupea dishu</i> . . . . .	Hilsa.
Ngā-yat-ni . . . . .	<i>Erethistes conta</i> .	
Ngā-yen-boung-zā . . . . .	<i>Muraneson telabon</i> .	
Ngā-young . . . . .	<i>Barbus</i> .	
Ngā-zyn . . . . .	<i>Aspidoparia morar</i> .	
Ngā-zyn-hpyu . . . . .	{ <i>Acinus jatus</i> .	
Ngā-zyn . . . . .	<i>A. Burmannicus</i> .	
Ngā-zyn-byun . . . . .	<i>Perilampus</i> .	
Ngā-touk-tu . . . . .	<i>Systemus</i> .	
Ngā-tsān-hlā . . . . .	<i>Mugil corsula</i> .	
Ngā-wā . . . . .	<i>Nuria daurica</i> .	
Ngā-wet-sāt . . . . .	<i>Serranus Malabaricus</i> .	
Ngā-wun . . . . .	<i>Gerres filamentosus</i> .	
Ngā-yān . . . . .	<i>Chrysophrys berda</i> .	
Ngā-yān-daing . . . . .	<i>Datnioides filamentosus</i> .	
Ngā-yān-goung-tō . . . . .	<i>Datnioides dugong</i> . . . . .	Sea-cow.
Ngā-yān-pa-naw . . . . .	<i>Ophioccephalus striatus</i> .	
Ngā-yān-thēng-ōng . . . . .	<i>O. marulius</i> .	
Ngā-young . . . . .	<i>O. striatus</i> .	
Ngā-yeng-bho (Tavoy) . . . . .	<i>O. guchua</i> .	
Ngā-zyn . . . . .	<i>O. punctatus</i> .	
Ngā-zyn-yaing . . . . .	<i>Arius Burmanicus</i> or <i>jatus</i> .	
Ngā-zyn-zāt . . . . .	<i>Mastacembalus zebrinus</i> .	
Ngā-zyn-zēng . . . . .	<i>Mugil corsula</i> .	
Ngā-zyn-zat . . . . .	<i>Macrones vittatus</i> .	
Ngā-yeng-boung-sā . . . . .	<i>Ambassia baculis</i> .	
Ngān . . . . .	<i>Macrones carassius</i> .	
Ngā-wā . . . . .	<i>Amblypharyngodon mola</i> .	
Ngā-wet-mā . . . . .	<i>Aspidoparia morar</i> .	
Ngā-wet-sāt . . . . .	<i>Auser</i> . . . . .	Goose.
Ngū . . . . .	<i>Chrysophrys berda</i> .	
Ngong . . . . .	<i>Datnioides polita</i> .	
Ngwē . . . . .	<i>Gerres filamentosus</i> .	
Ni-lā . . . . .	<i>Osmotreron</i> . . . . .	Green pigeon.
Oo-suf-foo (Arakan) . . . . .	<i>Turnix</i> . . . . .	Quail.
		Silver.
		Sapphire.
	<i>Eleotris caperata</i> .	

Oak-chyn . . . . .	<i>Buceros</i> . . . . .	Hornbill.
Pa-clăt . . . . .	<i>Liolepis guttatus</i> . . . . .	Herbivorous lizard.
Pa-dông . . . . .	. . . . .	Carpenter Bee.
Pa-lők . . . . .	<i>Teredo</i> . . . . .	Ship-worm.
Păn-bwen-sők . . . . .	<i>Nectarinia</i> . . . . .	Honey-sucker.
Păn-sők . . . . .	<i>Pogarus</i> . . . . .	Hermit-crab.
Pattā-myā . . . . .	. . . . .	Ruby.
Payen . . . . .	. . . . .	Amber.
Pa-ywet-hsək . . . . .	. . . . .	Ant.
Pazyu . . . . .	<i>Libellula</i> . . . . .	Dragon fly.
Pyn-ku . . . . .	. . . . .	Spider.
Peng-nyen . . . . .	. . . . .	King-fisher.
Peng-dăn-theh . . . . .	<i>Phyllornis Hardwickii</i> . . . . .	
Phyan . . . . .	<i>Lutra</i> . . . . .	Otter.
Phō-goung } . . . . .	<i>Megalaima Hodgsoni</i> . . . . .	
Pō-goung } . . . . .		
Pō-hăt . . . . .	<i>Blatta</i> . . . . .	Cock roach.
Pō-louk-lan } . . . . .		Mosquito or Gnat larva.
Pō-souk-htō } . . . . .		
Pők-thên . . . . .	<i>Calotes</i> . . . . .	Blood-sucker.
Pők-thên-byān . . . . .	<i>Draco</i> . . . . .	Flying lizard.
Pők-wā . . . . .	<i>Leos</i> . . . . .	Yellow bulbul.
Pwē . . . . .	<i>Rhizomys cinereus</i> . . . . .	Bamboo rat.
Pyā-goung . . . . .	<i>Apis</i> . . . . .	Wild Bee.
Pyān-hlwā . . . . .	<i>Chelidon urbica</i> . . . . .	Martin.
Pyān thwā . . . . .	<i>Cypselus balassensis</i> . . . . .	Palm swift.
Pyā-tu } . . . . .		Mason wasp.
Pyā-du }		
Pyā-twē-hmet } . . . . .	<i>Nyctiornis Athertoni</i> . . . . .	
Pyā-tu-hmet }		
Pyn-leh-kyet-tu-yuē . . . . .	<i>Larus brunneicephalus</i> . . . . .	Gull.
Pyn-leh-ngā-hpoung-yō . . . . .	<i>Hemiramphus</i> . . . . .	Gar fish.
Pyn-leh-ngā-zyn-zāt . . . . .	<i>Equula raconius</i> . . . . .	
Pyn-leh-ngā-byē-mā . . . . .	<i>Balis Buchananii</i> . . . . .	
Pyn-leh-paw-hmet . . . . .	<i>Rhynchops albicollis</i> . . . . .	Scissors bill.
Pyn-leh-pō . . . . .	<i>Holothuria</i> . . . . .	Sea cucumber.
Pyn-leh-ngā-hpyu-thōk . . . . .	<i>Equula raconius</i> . . . . .	
Pyoung . . . . .	<i>Bos gaurus</i> . . . . .	Gour.
Sā . . . . .	. . . . .	Sparrows and Finches.
Sain . . . . .	<i>Bos Sondaicus</i> . . . . .	Banting.
Sa-pa-gyi . . . . .	<i>Python</i> . . . . .	Rock snake.
Shāt . . . . .	<i>Venus Cardinus</i> . . . . .	
Shwē . . . . .	. . . . .	Gold.
Shwē-hpyu . . . . .	. . . . .	Platinum.
Shyn . . . . .	<i>Sciurus</i> . . . . .	Squirrel.
Shyn-pyān . . . . .	<i>Pteromys</i> . . . . .	Flying squirrel.
Swōn-goung-hpyu . . . . .	<i>Haliastur Indus</i> . . . . .	Brahmince kite.
Swōn-pők . . . . .	<i>Milvus</i> . . . . .	Kite.
Syt-sa-li . . . . .	<i>Dendrocygna Auresce</i> . . . . .	Whistling teal.
Ta-ngāt . . . . .	<i>Donax</i> . . . . .	
Ta-ngō . . . . .	. . . . .	Chiton.
Ta-ra-shu . . . . .	<i>Tapirus Malayanus</i> . . . . .	
Tē-lē-kyouk . . . . .	. . . . .	Antimony.
Ti-ti-dwōt . . . . .	<i>Hoplopterus ventralis</i> . . . . .	'Tect-tee-ree.'
Tha-bēk-lweh . . . . .	<i>Copsychus saularis</i> . . . . .	The 'Diāl.'
Tha-byā . . . . .	<i>Placina</i> . . . . .	
Tha-lī-gā . . . . .	<i>Eulabes Javaensis</i> . . . . .	
Tha-men . . . . .	<i>Panolia Eldi</i> . . . . .	Munipur stag.

Tha-mi . . . . .	<i>Calyptrea</i> . . . . .	Cup and saucer limpets.
Thān . . . . .		Intestinal worm.
Tha-ngō . . . . .		Chiton.
Thān-kyouk . . . . .		Ironstone.
Thān-laik-kyouk . . . . .		Leadstone.
Thān-taik-kyouk . . . . .		Iron pyrites.
Thēng-kyā . . . . .	<i>Circus melanoleucus.</i>	
Thēng-kyet-mā . . . . .	<i>Astur badius.</i>	
Then-twōn . . . . .	<i>Trochus.</i>	
Then-khwē-jyat . . . . .	<i>Manis</i> . . . . .	Pangolin.
Tho . . . . .	<i>Ovis</i> . . . . .	Sheep.
Thwē-shi . . . . .	<i>Pomatorrhinus olivaceus.</i>	
Thyt-touk . . . . .		Wood-pecker.
Ti . . . . .		Earth-worm.
Tor-ji-len . . . . .	<i>Compsosoma radiatum</i> . . . . .	Rat snake.
Tor-hsyn . . . . .	<i>Elephas Indicus</i> (wild).	
Tor-khwē . . . . .	<i>Canis rutilans.</i>	
Tor-kyet . . . . .	<i>Gallus ferrugineus.</i>	
Tor-lék } . . . . .	<i>Manouria emys.</i>	
Toung-leik } . . . . .		
Tor-tsék . . . . .	<i>Nemorhadus</i> . . . . .	Goat antelope.
Tor-wet . . . . .	<i>Sus cristatus</i> . . . . .	Wild boar.
Tor-wūn-beh } . . . . .	<i>Sarkidiornis melanotis.</i>	
Tor-wōn-bai } . . . . .		
Touk-teh . . . . .	<i>Gecko guttatus</i> . . . . .	The Gecko.
Toung-pi-sōk . . . . .	<i>Upupa longirostris</i> . . . . .	Hoopoe.
Tsék . . . . .	<i>Capra</i> . . . . .	Goat.
Tsāt . . . . .	<i>Rusa Aristotelis</i> . . . . .	Sambur.
Tsweh . . . . .	<i>Tupaia.</i>	
U-loung . . . . .	<i>Paro muticus.</i>	
Wā-lpa-lē . . . . .	<i>Phenicophaus tristis.</i>	
Wā-goung-hnet . . . . .	<i>Garrular</i> . . . . .	Babbling thrush.
Wet-wun . . . . .	<i>Ursus Tibetanus</i> . . . . .	Bear.
Wun-lō . . . . .	<i>Pelecanus.</i> . . . . .	Pelican.
Wun-lek . . . . .	<i>Haliaetus</i> . . . . .	Fishing Eagle.
Wun-lō . . . . .	<i>Aquila</i> . . . . .	Eagle.
Yē-kyet . . . . .	<i>Octopus</i> . . . . .	Cuttle-fish.
Yē-kyet-mā . . . . .	<i>Rallus indicus</i> . . . . .	Rail.
Yē-bō . . . . .	<i>Gerris.</i>	
Yē-hmō . . . . .		Sponge.
Yē-kywet . . . . .		Water rats.
Yē-nan . . . . .		Petroleum.
Yen-boung zā . . . . .	<i>Aspidoparia morar.</i>	
Yē-paw-ngā . . . . .	<i>Perilampas atpar.</i>	
Yōng . . . . .	<i>Tragulus. Lepus</i> . . . . .	Mouse-deer. Hare.
Youk-thwā . . . . .	<i>Unio</i> . . . . .	Freshwater mussels.
Young-yin . . . . .		Horbills (large).
Young-yin-net . . . . .	<i>Acceros subruficollis.</i>	
Yyt . . . . .	<i>Eupoelamus.</i>	
Za-yet . . . . .	<i>Acridotheres ginginianus.</i>	Bank mynah.
Za-yet-mouk-tyñ . . . . .	<i>A. fuscus</i> . . . . .	Mynah.
Za-yet-kye zā . . . . .	<i>Sturnopastor contra</i> . . . . .	Pied mynah.
Zi-kwet . . . . .	<i>Glaucidium cuculoides.</i>	Cuckoo owl.
Zyn-yaw . . . . .	<i>Limosa aegocephala.</i>	

## APPENDIX C.

## A SHORT GLOSSARY OF ZOOLOGICAL TERMS.

Acephalous.	Having no head.
Acetabula.	The suckers on the arms of <i>Cephalopods</i> .
Aerodont.	Teeth are so called when attached by their base to the edge of the jaw.
Actinula.	The polypoid embryo into which the eggs of some <i>Hydroids</i> are developed.
Agamic.	Non-sexual reproduction, as <i>budding</i> , or <i>fissuring</i> .
Alternation of generations.	Where an animal produces a progeny not resembling itself, but which resemblance returns in two, three, or four generations. So that two, three, or four lives go to form a species, each intermediate form being the result of <i>development</i> , as distinguished from <i>reproduction</i> .
Amphicœlous.	Vertebrae are so called, when concave at both ends.
Analogy.	Similarity of function without correspondence of parts. For example, the functions of the stomach of an animal are in part analogous to those of the roots of a plant.
Anchylosis.	The union of two or more bones.
Antennæ.	Jointed organs of sensation, before or between the eyes of the Arthropoda.
Anus.	The external termination of the intestines.
Astragalus.	A tarsal bone articulating with the <i>tibia</i> .
Atavism.	Reversion, or the appearance in an individual of a character derived not from the parents, but from a remote ancestor.
Atlas.	The first vertebra of the neck.
Axis.	The next vertebra to the <i>Atlas</i> .
Biology.	The science of living beings, animal or vegetable.
Branchiæ.	Organs analogous to the lungs of mammals, wherein the blood is oxygenized.
Bronchi.	The branches of the windpipe.
Byssus.	The filaments by which some molluscs secure themselves to fixed objects.
Cæcum.	A blind sac opening into the <i>duodenum</i> .
Cainozoic.	The Tertiary period of geology.
Calcaneum.	The heel bone or <i>os calcis</i> .
Carapace.	The dorsal shield of <i>Crustacea</i> and <i>Chelonia</i> .
Ceratode.	The horny substance of sponges.
Cercariæ.	The tadpole-like larvæ of <i>Trematode</i> worms.
Cere.	The naked skin at the base of the bill of some birds.
Cerebellum.	The posterior portion of the brain.

Cheke.	The anterior thoracic legs or claws of <i>Crustacea</i> .
Chitine.	The substance composing the elytra of beetles.
Chlorophyll.	The green colouring matter of leaves, and found also in the <i>Infusoria</i> and <i>Turbellaria</i> .
Chyle.	The nutrient portion of the chyme, absorbed into the blood.
Chyme.	The digested food as it passes from the stomach.
Clavicle.	The collar-bone.
Cloaca.	The common excretory opening of birds and reptiles.
Coceyx.	The anchylosed tail bones in some birds and mammals.
Coelenterata.	Sponges, Hydrozoa and Corals.
Colon.	The large intestine opening into the <i>rectum</i> .
Columella.	The axis of a spiral univalve.
Commensal.	An animal that lives with, but does not feed on, its host.
Condyle.	The articulating surface of a bone.
Ctenoid.	Scales of fish are so called which have a toothed hinder margin.
Cycloid.	Scales of fish are so called which have entire margins.
Diastema.	An interval in the line of the teeth.
Digitigrade.	An animal that walks on its toes, as a cat.
Dioecious.	Animals or plants in which the sexes are separate individuals.
Dolicocephalous.	When the length of the cranium exceeds its breadth.
Duodenum.	The first portion of the small intestine.
Elytra.	The wing-covers of beetles.
Embryo.	A young animal or plant before it is released from the egg, womb, or seed.
Eocene.	The earliest Tertiary period.
Epiglottis.	A cartilaginous valve protecting the <i>larynx</i> .
Epiphragm.	The hardened secretion which closes the shell of dormant snails.
Epithelium.	A thin membrane investing mucous surfaces.
Evolution.	The descent by modification of species from a common ancestor.
Ganglion.	A thickening of a nerve, or a nervous centre.
Gemmation.	Reproduction by means of a bud.
Gland.	An organ that secretes its peculiar fluid from the blood, as the liver does gall. Some advanced thinkers regard the action of the brain as analogous to that of a gland, its product being the phenomena, comprehended under the term ' <i>mind</i> '; hence the relation subsisting between the brain and the mental power of an individual, and the dependence of mental and moral disease, on the physical disease or degeneracy of the mental organ or <i>brain</i> .
Glottis.	The opening of the <i>larynx</i> .
Hallux.	The great toe.
Haustellum.	The suctorial proboscis of insects.
Hectocotylus.	An arm of a cuttle-fish modified into a free reproductive organ, and once regarded as a parasitical worm, residing on the female cuttle-fish.
Hermaphrodite.	Having the sexes united in the same individual.
Heterocercal.	The tail of a fish is so called when its lobes are unequal, as in a shark.
Homocercal.	A tail of a fish is so called when its lobes are equal, as in most fishes.
Homology.	Identity of structure, notwithstanding diversity of form or function; for example, analogy there is none, but a strong homology, between the horn of a rhinoceros and the hair of a man's head.
Hydatid.	A watery sac produced by <i>entozoa</i> .
Hyoid.	The bone of the tongue.
Ileum.	The small intestine opening into the <i>colon</i> .
Imago.	The perfect insect, as a butterfly.
Ingluvies.	The ' <i>crop</i> ' of birds, a dilatation of the <i>oesophagus</i> .
Instinct.	The unconscious cause of action as distinguished from the reflective cause.



Larva.	An indefinite term for an early stage of animals which undergo metamorphosis after quitting the egg.
Larynx.	The upper part of the windpipe.
Life.	The coordination of the organized tissues, the disturbance of which means disease, and the arrest or disruption of which is death.
Lores.	A stripe between the bill and eye in birds.
Materialist.	One who, rejecting the supernatural intervention, or <i>Deus ex machina</i> of the poets, refers all natural effects to natural causes.
Maxilla.	The upper jaw of vertebrates.
Mesentery.	The membrane connecting the small intestines.
Mesozoic.	The secondary period of Geology, from the Trias to the Chalk inclusive.
Metatarsal.	The bones which intervene between the <i>tarsus</i> and toes.
Micropyle.	An aperture in the ovum by which fertilization is effected.
Mimetic.	The resemblance borne by one group of animals to another.
Miocene.	The middle Tertiary epoch.
Molecule.	The smallest and ultimate division of matter.
Monecious.	An animal or plant in which the sexes are united in the same individual.
Monomyary.	A bivalve shell, provided with a single muscle, as an oyster.
Morphology.	The history of the modification of form of an organ, independent of function.
Muzzle.	The naked part of the nose in ruminants.
Nauplius.	The earliest larval stage of <i>Crustacea</i> .
Nectocalyx.	The swimming-bell of a <i>Medusa</i> .
Notochord.	The embryonic precursor of the spinal marrow.
Nymph.	The active pupa of some insects.
Odontophore.	The <i>radula</i> , or teeth-bearing band of the mollusca.
Oesophagus.	The gullet, connecting mouth and stomach.
Opisthocelous.	Vertebrae which are concave behind only.
Orthognathous.	When the jaws do not project, and the teeth are perpendicular; used in opposition to Prognathous.
Oscula.	The large exhalent orifices of a sponge.
Ostioles.	The smaller inhalent orifices of a sponge.
Otoliths.	The internal ear-bones of fishes. Also calcareous bodies, of auditory function, among the lower animals.
Ovary.	The organ wherein the <i>ova</i> are produced.
Ovipositor.	A tubular organ possessed by many insects for placing their egg in security.
Ovoviviparous.	Animals are so called which hatch their eggs within their own bodies, as some snakes and fishes.
Paleozoic.	The oldest division of fossiliferous rocks, from the Laurentian to the Permian inclusive.
Pallium.	The mantle of mollusca.
Pallial sinus.	The impression on the shell which marks the extent and position of the siphonal tubes.
Parthenogenesis.	Non-sexual reproduction, including budding and like methods.
Peritreme.	The mouth of a univalve shell.
Phalanges.	The bones of the digits.
Phragmacone.	The conical endoskeleton of a Belemnite.
Placoid.	The name given to fishes having bony plates, grains or spines for scales.
Plantigrade.	Animals which walk on the soles of the hind feet, like a bear.
Plasma.	The part of the blood wherein the corpuscles float.
Plastron.	The ventral shield of <i>Chelonia</i> .
Procerolous.	Vertebrae are so called which are concave in front only.
Proscoplex.	The earliest larval stage of a <i>Cestode</i> .
Protoplasm.	The material basis of life. A compound of hydrogen, oxygen, nitrogen and carbon, and very similar to <i>protein</i> and <i>albumen</i> .

Protozoa.	The lowest forms of animal life.
Proventriculus.	The inferior dilated portion of the œsophagus in birds.
Pupa.	The stage in insect development which precedes the final or imago state.
Quadrate bone.	A bone connecting the upper and lower jaws of reptiles and birds.
Radius.	One of the bones of the forearm.
Remiges.	The quill feathers of a bird's wing.
Sacrum.	Anchlyosed vertebrae to which the pelvic bones are attached.
Sarcodæ.	Protoplasm of the <i>Protozoa</i> .
Seolex.	The second larval stage of a <i>Cestode</i> .
Scutes.	The bony dermal scales of crocodiles.
Segmentation.	Yolk-division, the breaking up of the yolk into cells as a result of fecundation.
Sesamoid bones.	Small bones developed in the tendons.
Sessile.	With a broad base, as opposed to 'stalked.'
Swim bladder.	The air-bladder present in some fish, the homologue of the lungs of a mammal, but not analogous in function.
Tarsal.	The small bones of the feet of mammals.
Teleology.	The doctrine of design as evinced by structure.
Tibia.	The shin-bone of mammals, birds, and reptiles.
Ulna.	One of the bones of the forearm.
Umbo.	The boss or beak near the hinge of a bivalve.
Wallace's line.	The division between the Malayan and Austro-Malayan regions. It passes between Bali and Lombok through the Macassar Straits dividing Borneo from Celebes to the North End, between Mindanao and Gilolo.
Zoëa.	A larval stage in the higher <i>Crustacea</i> .

Si qua videbuntur chartis tibi, Lector, in illis,  
 Sive obscura nimis, sive Latina parum;  
 Non meus est error; nocuit librarius illis,  
 Dum properat versus annumerare tibi.  
 Quod si non illum, sed me peccasse putabis;  
 Tunc ego Te credam, cordis habere nihil.

Mart. Lib. l. viii.



## INDEX.

## PART I.—GENERA AND SPECIES.

- a.  
 abbotti, 365.  
 abbreviata, 142.  
 abbreviatus, 198.  
 abdicalis, 55.  
 abdominalis, 42, 75, 82,  
     117.  
 abducalis, 65.  
 abisara, 95.  
 ablables, 299.  
 abnormis, 142.  
 aboe, 76.  
 abramus, 432.  
 abraxalis, 55.  
 abraxas, 57.  
 abromnis, 373.  
 abrostola, 71.  
 abrota, 99.  
 abrupta, 66.  
 absens, 94.  
 abstalis, 56.  
 abstrusalis, 54.  
 acaciusialis, 56.  
 acanthia, 42.  
 acanthocoris, 42.  
 acantholipes, 72.  
 acanthophthalmus, 273.  
 acanthopsis, 272.  
 acanthosaura, 334.  
 acanthurus, 215.  
 acanthylis, 357.  
 acara, 64.  
 acarus, 33.  
 accipiter, 404.  
 accipitrinus, 406.  
 accentronura, 281.  
 aceraius, 113.  
 aceris, 98.  
 aceros, 351.  
 achæa, 67.  
 achates, 172.  
 achatina, 67.  
 achatinacea, 172.  
 achatinus, 351.  
 achelous, 31.  
 acherontia, 89, 90.  
 achirus, 249.  
 achylodes, 91.  
 acidalia, 59.  
 aciptilus, 52.  
 acmella, 159, 163.  
 acontia, 72.  
 acontius, 99.  
 acornans, 383.  
 acosmeryx, 89.  
 acosmetia, 74.  
 acridium, 45.  
 acridotheres, 385.  
 acrocephalus, 372.  
 acronycta, 76.  
 acronyetoides, 69.  
 acte, 94.  
 acteus, 90.  
 actias, 79.  
 actinodura, 367.  
 actinolite, 13.  
 actitis, 395.  
 actorionalis, 54.  
 acuformis, 150.  
 aculeata, 58.  
 acuminata, 142.  
 acupicta, 147.  
 acus, 150.  
 acuta, 148, 276, 400.  
 acuticauda, 357, 384.  
 acuticosta, 42.  
 acutifrons, 150.  
 acutiphimis, 226.  
 acutirostris, 253, 255.  
 adansoni, 134.  
 adephaga, 113.  
 adima, 100.  
 adipula, 98.  
 adisura, 72.  
 aditellus, 64.  
 adjustus, 141.  
 adolias, 100.  
 adonira, 95.  
 adorium, 108.  
 adulatrix, 71, 88.  
 adunco-spinosus, 141.  
 adusta, 75, 149.  
 adea, 85.  
 adon, 372.  
 æga, 24.  
 ægialitis, 393.  
 ægithaliscus, 377.  
 ægocephala, 395.  
 ægocera, 88.  
 ægosoma, 109.  
 ægrota, 90.  
 ægyptiaca, 134.  
 amene, 53, 87.  
 amona, 101.  
 anea, 378, 388.  
 anella, 52.  
 aneus, 31, 213.  
 enigmatica, 125.  
 æonistis, 86.  
 æquilinearia, 62.  
 æquilineata, 57.  
 æquipinnatus, 270.  
 æquivoca, 133.  
 aralatus, 375.  
 arata, 57, 59.  
 aratus, 112.  
 æruginosus, 405.  
 æstuans, 122.  
 æthalochroa, 44.  
 æthereus, 401.  
 æthopyga, 361.  
 ætobatis, 287.  
 affinis, 63, 82, 117, 133,  
     145, 150, 164, 166, 216,  
     350, 354, 356, 379, 385,  
     386, 405, 408, 427, 433.  
 agæus, 43.  
 agamarschana, 102.  
 agamemnon, 105.  
 agastia, 56.  
 agathia, 60.  
 agathodes, 56.  
 agathon, 104.  
 agestor, 105.

- agetes, 105.  
 agilis, 375.  
 aglea, 102.  
 agleoides, 102.  
 aglossa, 56.  
 agna, 100.  
 agnathi, 47.  
 agnidra, 62.  
 agostina, 102.  
 agramma, 71.  
 agricolus, 372.  
 agrilus, 112.  
 agriopis, 73.  
 agrotis, 73.  
 ailanthus, 53.  
 akallopisus, 210.  
 akouktoungensis, 175.  
 ala, 135, 397.  
 alamis, 70.  
 alatus, 154.  
 alauda, 385.  
 alaudarius, 403.  
 alaudula, 385.  
 alavona, 53.  
 alba, 397.  
 albescens, 144.  
 albicilla, 169, 383.  
 albicincta, 70.  
 albicollis, 381, 401.  
 albicosta, 76.  
 albidaria, 61.  
 albidentata, 61.  
 albidisca, 73.  
 albilascia, 69, 83.  
 albifasciata, 91.  
 albifrons, 52, 85, 381.  
 albifrontata, 381.  
 albigularis, 366.  
 albilinea, 68, 69.  
 albinota, 73.  
 albinotalis, 64.  
 albiplana, 39.  
 albiplunctata, 78.  
 albirena, 74.  
 albirenalis, 64.  
 albirostris, 351, 364.  
 albig stigma, 75.  
 albiventris, 371.  
 albivitta, 67.  
 albocinerea, 86.  
 albofasciata, 62, 101.  
 albofasciatus, 241.  
 albofasciella, 53.  
 albugularis, 364, 367.  
 alboguttatus, 234.  
 albolineatus, 126, 270.  
 albomaculata, 74.  
 albomaculatus, 109.  
 albomarginata, 88.  
 alboniger, 405, 416.  
 albonotatus, 355.  
 albopunctata, 329.  
 albopunctatus, 226.  
 albig stigma, 76.  
 albovaricosa, 113.  
 albavittata, 73.  
 albula, 149.  
 alcatheae, 102.  
 alcedo, 353.  
 alcinus, 405.  
 aleiphron, 86.  
 aleippe, 98, 365.  
 alemenor, 105.  
 almeone, 104.  
 aleurus, 368.  
 alcyonaria, 18.  
 alecto, 89.  
 alectrion, 144.  
 aletia, 76.  
 alexandrina, 393.  
 alexis, 92.  
 alica, 90.  
 alienaria, 61.  
 alienata, 58.  
 allmanni, 17.  
 almana, 97.  
 alobus, 433.  
 alompra, 77.  
 alope, 82, 103.  
 alophonerpes, 347.  
 alpheia, 82.  
 alpheda, 100.  
 alphenus, 82.  
 alpheus, 26.  
 alseonax, 382.  
 alsocomus, 388.  
 alternata, 76.  
 altivelis, 188.  
 alva, 82.  
 alveolus, 154.  
 alycaeus, 166, 167.  
 alysos, 91.  
 amabilis, 87, 299.  
 amalia, 103.  
 amalthea, 158.  
 amandava, 384.  
 amantes, 94.  
 amara, 91.  
 amasa, 94.  
 amathusia, 97, 101.  
 amauroptera, 353.  
 amba, 98.  
 ambaressa, 94.  
 ambassis, 193.  
 amber, 15.  
 ambica, 99.  
 amblyapistus, 209.  
 amblyceps, 259.  
 amblychia, 61.  
 amblypharyngodon, 266.  
 amblypodia, 93.  
 amboinensis, 337.  
 ambulyx, 89.  
 ameria, 94.  
 amerila, 82.  
 amethyst, 13.  
 amethystina, 122.  
 amherstiae, 390.  
 amicta, 352.  
 ammonia, 67.  
 ammophila, 118.  
 ampeliceps, 356.  
 amphibole, 13.  
 amphicrates, 49.  
 amphidasys, 62.  
 amphidromus, 176.  
 amphigonina, 65.  
 amphipneus, 277.  
 amphiprion, 239.  
 amphipyra, 70.  
 amphitritalis, 55.  
 amphora, 166.  
 amplexicaudatus, 425.  
 ampulla, 140.  
 ampullaria, 158.  
 ampullarina, 178.  
 amurensis, 403.  
 amussim, 127.  
 amyna, 74.  
 amyntusalis, 51.  
 amythaon, 101.  
 anabas, 239.  
 anagnia, 88.  
 anaitis, 57.  
 analis, 67, 118, 349, 369.  
 anampses, 244.  
 ananta, 98.  
 anarsia, 53.  
 anas, 399.  
 anastomus, 398.  
 anatina, 137.  
 anaxares, 145.  
 anaxias, 96.  
 anceps, 173.  
 anceus, 90.  
 anchora, 43.  
 anchorago, 243.  
 ancillaria, 146.  
 ancyra, 39.  
 andamana, 79, 83, 85, 86,  
     88, 89, 94, 98, 104.  
 andamanalis, 56.  
 andamanensis, 102, 113,  
     151, 176, 211, 234, 298,  
     330, 349, 355, 356, 360,  
     371, 379, 381, 386, 405,  
     418, 427, 454, 479.  
 andamaniae, 166.  
 andamanica, 167, 361.  
 andamanicus, 177.  
 andamia, 235.  
 andersoni, 47, 85, 95, 165,  
     169, 175, 390, 413.  
 andersoniana, 30, 132, 155.  
 andersonianus, 130, 177.  
 andraca, 77.  
 andramon, 49.  
 androcles, 93.  
 androgeos, 105.  
 anexibia, 104.  
 angrona, 62.  
 angronaria, 61.

- angias, 92.  
 anglica, 401.  
 angra, 264.  
 anguilla, 278.  
 anguina, 175, 329.  
 angularia, 63.  
 angularis, 96, 190.  
 angulata, 95, 134, 136, 166.  
 angulifascia, 62.  
 angulifera, 57, 83, 87.  
 angusta, 148.  
 angustata, 99.  
 angusticeps, 301.  
 angustifrons, 45.  
 angustus, 35.  
 anisodera, 108.  
 anisodes, 59.  
 anisoneura, 69.  
 anjira, 98.  
 anna, 79.  
 auneetans, 369, 377, 378,  
     433.  
 annularis, 201.  
 annulata, 118, 147, 153.  
 annulus, 153.  
 anodonta, 81.  
 anomala, 112, 150.  
 anomia, 125.  
 anomis, 70.  
 anomura, 27.  
 anophia, 69.  
 anops, 95.  
 anoratha, 65.  
 anorhinus, 351.  
 anosthetus, 401.  
 auous, 401.  
 anserina, 175.  
 ant-cow, 38.  
 ant-lion, 48.  
 antennatus, 224.  
 antennella, 17.  
 antestia, 43.  
 anthelus, 100.  
 anthena, 81.  
 antheraea, 79.  
 anthocincla, 363.  
 anthophila, 72.  
 anthophilata, 59.  
 anthophora, 122.  
 anthrax, 49.  
 anthreptes, 361.  
 anthus, 375.  
 antica, 83, 86.  
 anticlea, 57.  
 anticrates, 105.  
 anticyra, 81.  
 antigarbas, 94.  
 antigone, 394.  
 antijerius, 242.  
 antiloehus, 42.  
 antimony sulphide, 10.  
 antiphates, 105.  
 antiquata, 134.  
 antiquorum, 146.  
 antoni, 149.  
 anuga, 71.  
 anusorex, 440.  
 aor, 250.  
 aoris, 97.  
 apamea, 75.  
 apameoides, 74.  
 apate, 111.  
 apatura, 99.  
 apela, 82.  
 aperta, 158.  
 apertissima, 138.  
 apertum, 132.  
 aphidas, 100.  
 aphidiphaga, 107.  
 aphis, 37.  
 aphneus, 94.  
 aphusia, 53.  
 apiades, 100.  
 apicalis, 69, 78, 82, 86, 97.  
 apicata, 63, 148.  
 apicaudus, 388.  
 apicipunctella, 53.  
 apiculata, 142.  
 apis, 119.  
 apistus, 208.  
 aplysia, 140.  
 apocryptichthys, 228.  
 apocryptis, 228.  
 apoderus, 109.  
 apogon, 194, 267.  
 apogonia, 112.  
 apomecyna, 109.  
 apona, 77.  
 appendiculata, 39.  
 apphadana, 64.  
 appias, 103.  
 aprion, 198.  
 apsarasa, 73.  
 apua, 273.  
 apurima, 64.  
 aqua, 91.  
 aqua-marine, 14.  
 aquatilis, 55.  
 aquila, 401.  
 arabica, 153.  
 arachnoidea, 149.  
 arachnoides, 145.  
 arachnothera, 361.  
 arakan earth oil, 15.  
 arakana, 133, 135, 148,  
     176, 337.  
 arakanensis, 165, 167, 175.  
 arama, 87.  
 arata, 173.  
 arbela, 77.  
 arboricola, 391.  
 area, 128.  
 areadia, 95.  
 arcesilaus, 101.  
 archesia, 66.  
 arctia, 82.  
 arctietis, 169.  
 arctoides, 475.  
 aretonyx, 463.  
 arctotenia, 67.  
 arcturus, 105.  
 arcuata, 60, 67.  
 arcuatus, 118.  
 arcularia, 141.  
 ardates, 93.  
 ardea, 397.  
 ardealis, 54.  
 ardeola, 394, 398.  
 ardesiacus, 387.  
 ardetta, 398.  
 arenacea, 66, 74.  
 areas, 82.  
 arenicola, 23.  
 areola, 119.  
 areste, 94.  
 argala, 397.  
 argentalis, 56.  
 argentauris, 377.  
 argentea, 84.  
 argenteus, 196.  
 argentifera, 81.  
 argenteilinea, 62.  
 argenteilineata, 56.  
 argenteimaiculatus, 192.  
 argina, 87.  
 argiva, 68.  
 argonauta, 182.  
 argus, 87, 202, 389.  
 argynnis, 98.  
 argyris, 59.  
 argyrostoma, 169.  
 aria, 91.  
 ariadne, 97.  
 arichanna, 57.  
 aricia, 153.  
 ariophanta, 174.  
 aristhala, 80.  
 aristolochia, 105.  
 aristotelis, 456.  
 arius, 252.  
 armata, 334.  
 armatus, 217, 236.  
 armigera, 73, 428.  
 armillatus, 166.  
 armstrongi, 142.  
 arnearia, 62.  
 arni, 461.  
 aroa, 83.  
 arquatus, 395.  
 arragonite, 11.  
 arrhenodes, 109.  
 arsenides, 10.  
 arsmoe, 97.  
 arsius, 248.  
 artamus, 380.  
 artata, 166.  
 artaxa, 84.  
 artemis, 41.  
 artena, 67.  
 arthriticus, 164.  
 articulata, 168.  
 articulatum, 154.

- artificiosa, 172.  
 artocarpī, 87.  
 aruanum, 241.  
 arula, 166.  
 arundinax, 372.  
 arx, 173.  
 asaphis, 135.  
 asbestos, 13.  
 ascaris, 22.  
 asellus, 152.  
 ashmoliana, 44.  
 asialis, 54.  
 asiatica, 52, 350, 353, 361, 397.  
 asiaticum, 131.  
 asiaticus, 355.  
 asopia, 56.  
 asper, 154, 296.  
 aspera, 318.  
 aspergillum, 24, 138.  
 aspidēs, 172.  
 aspidomorphā, 108.  
 aspidoparia, 269.  
 aspilates, 58.  
 aspirans, 165.  
 aspongopus, 42.  
 assama, 79.  
 assamensis, 35, 39, 440, 477.  
 assamica, 87, 385.  
 assimilis, 365, 373, 388.  
 assiminea, 156.  
 aster, 171.  
 asterie, 97.  
 astraea, 82, 87.  
 stricta, 148.  
 astictopterus, 92.  
 astur, 404.  
 astura, 54.  
 aswa, 96.  
 ataranensis, 173, 174.  
 atax, 32.  
 atella, 98.  
 ater, 165, 174.  
 athamas, 100.  
 athertoni, 352.  
 athrachelia, 111.  
 athyma, 99.  
 athyra, 400.  
 athyrma, 67.  
 atkinsoni, 64, 72, 85, 92, 172, 266.  
 atkinsonia, 52.  
 atkinsoniana, 30.  
 atlas, 80.  
 atomaria, 83.  
 atpar, 271.  
 atra, 378, 396.  
 atrata, 135.  
 atratus, 349.  
 atrax, 94.  
 atretium, 302.  
 atricapilla, 381.  
 atricapillus, 353, 369.  
 atricauda, 275.  
 atriceps, 319.  
 atrigularis, 373.  
 atripinnis, 248.  
 atrodorsalis, 413.  
 atropurpurea, 169.  
 atrostigmella, 64.  
 atrostipata, 57, 61.  
 atrovirens, 73, 76.  
 atta, 117.  
 attacus, 80.  
 attatha, 84.  
 attegia, 173.  
 attentata, 59.  
 attenuata, 98, 157.  
 atteva, 53.  
 attu, 256.  
 atymnus, 94.  
 atys, 140.  
 auchmis, 76.  
 auge, 98.  
 augite, 13.  
 augur, 42.  
 aulacophora, 108.  
 aulicus, 306.  
 aulopis, 174.  
 aurantia, 69, 147, 401.  
 aurantiaca, 68, 87.  
 aurantiacus, 163.  
 aurantiaria, 56.  
 aurata, 57, 361, 473.  
 aureliata, 59.  
 aureola, 385.  
 aureosericea, 119.  
 aureus, 459, 466.  
 auricella, 52.  
 auricula, 178.  
 aurifera, 71.  
 auriflua, 64.  
 aurifrons, 370.  
 anriga, 200.  
 aurigera, 73.  
 aurilimbata, 85.  
 auriplena, 73.  
 auris-cati, 150.  
 auris-felis, 178.  
 auris-judæ, 178.  
 aurita, 412.  
 auritracta, 81.  
 auritus, 195.  
 aurivittata, 91.  
 aurolinealis, 55.  
 auropunctatus, 470.  
 aureora, 372.  
 auroviridis, 73.  
 austeni, 44, 113, 377.  
 austenia, 98.  
 australe, 132.  
 australe, 126, 158, 401.  
 automedon, 90.  
 autumnalis, 33.  
 auxomitia, 55.  
 auzea, 63.  
 avæ, 131, 166.  
 avanica, 176.  
 avanum, 132, 165.  
 avatar, 104.  
 avatara, 95.  
 avensis, 380.  
 aventiaria, 59.  
 avicularia, 59.  
 ansuree, 399.  
 azazia, 66.  
 azurea, 381.
- b.**
- bacaila, 272.  
 baccata, 155.  
 bacha, 405.  
 bacillum, 172.  
 bacillus, 44.  
 bacteria, 45.  
 baculis, 194.  
 badia, 144.  
 badis, 205.  
 badius, 404, 406, 419, 421.  
 badra, 90.  
 bætica, 92.  
 bagarius, 259.  
 bahula, 99.  
 bailloni, 397.  
 bala, 88.  
 baladeva, 95.  
 balenoptera, 445.  
 balakadyen, 321.  
 balarama, 100.  
 baldus, 96.  
 balicassius, 378.  
 balistes, 282.  
 ballatha, 66.  
 balli, 407.  
 balteata, 155.  
 bambusa, 92.  
 bambusicola, 391.  
 bandicoota, 418.  
 baniana, 66.  
 bankanensis, 241.  
 banksia, 96.  
 banyamas, 382.  
 barakporensis, 173.  
 barbarella, 53.  
 barbei, 478.  
 barbus, 266.  
 barclayanus, 142.  
 bargosa, 62.  
 barilius, 269.  
 barnacles, 24.  
 barsine, 87.  
 basalis, 64, 81, 84, 118.  
 basiana, 89.  
 basillava, 84.  
 basillavata, 61.  
 basilaris, 47.  
 basilianus, 113.

- basimaculata, 84.  
 basinigra, 83.  
 basinota, 86.  
 basipuncta, 63.  
 basistriga, 73.  
 basistrigalis, 65.  
 basistrigaria, 61.  
 baska, 339.  
 basseinensis, 173.  
 bastialis, 56.  
 batagur, 338.  
 batana, 155.  
 batassiensis, 357.  
 batis, 76.  
 batissa, 132.  
 batocera, 109.  
 batoides, 228.  
 batrachocephalus, 251.  
 batrachostomus, 356.  
 batrachus, 223.  
 baucis, 15.  
 bauhineæ, 52.  
 baya, 383.  
 baylei, 387.  
 baza, 405.  
 beavani, 91, 353, 373.  
 beekii, 153.  
 beddomeana, 156.  
 bee lice, 48.  
 behniana, 167.  
 bela, 96.  
 belangeri, 143, 269, 367, 411.  
 belcheri, 318.  
 belenois, 103.  
 belladonna, 102.  
 bellia, 338.  
 bellicosa, 117.  
 bellona, 118.  
 bellulus, 302.  
 belone, 261.  
 belostoma, 41.  
 bembex, 118.  
 bengalensis, 81, 93, 132, 156, 168, 242, 249, 278, 353, 360, 383, 394, 401, 402, 406, 422.  
 bengaliaria, 62.  
 benjamini, 90.  
 bensonianum, 176.  
 berda, 206.  
 berdmorei, 260, 265, 272, 292, 327, 331, 414.  
 beregra, 68.  
 berenicornis, 351.  
 berghii, 401.  
 bernardus, 100.  
 berrhæa, 73.  
 berta, 60.  
 bertula, 64.  
 beryl, 14.  
 betulinus, 151.  
 beturia, 92.  
 bhadra, 95.  
 bhaga, 90.  
 bhagava, 90.  
 bhairava, 95.  
 bhamoense, 165.  
 bhamoensis, 130.  
 bhana, 83.  
 bharetta, 77.  
 bheroba, 77.  
 bhima, 95.  
 bhringa, 378.  
 bhutanitis, 105.  
 biamata, 149.  
 biauritus, 211.  
 biblis, 98.  
 bicalearatum, 390.  
 bicallusa, 156.  
 bicatenatus, 299.  
 bicaudata, 59.  
 bicincta, 388.  
 bicolor, 107, 112, 113, 117, 133, 135, 278, 303, 388, 429.  
 bicolorata, 59.  
 bicornis, 44.  
 bicuspis, 113.  
 bifaria, 143.  
 bifasciata, 60, 84, 95, 404.  
 bifasciatus, 219, 211.  
 bifoveolum, 175.  
 bifrons, 166.  
 bigutta, 84.  
 biguttata, 112.  
 biguttatus, 192.  
 bilineata, 62, 262.  
 bilineatus, 197.  
 bilitonensis, 234.  
 bimaculata, 77, 112.  
 bimaeculosa, 141.  
 binghami, 98.  
 binsitta, 53.  
 binturong, 469.  
 biocularis, 64, 69.  
 bipars, 72, 86.  
 biplagiata, 107.  
 bipunctata, 77.  
 birgus, 27.  
 birmana, 172.  
 birmanica, 135.  
 birmanorum, 174.  
 bisaltide, 101.  
 bisecta, 89.  
 biseriatus, 82.  
 bistrigata, 75.  
 bistrigatus, 200.  
 bistrigiceps, 372.  
 bithia, 59, 61.  
 bittacus, 48.  
 bitubiferum, 165.  
 bivitalis, 54.  
 bivittaria, 63.  
 bivittata, 75.  
 bizonatus, 109.  
 bizone, 87.  
 blabophanes, 53.  
 blainvillei, 143.  
 blanda, 101.  
 blanden, 47.  
 blanfordi, 106, 174, 177, 309, 373, 414.  
 blanfordiana, 155, 157, 167, 170, 172.  
 blasius, 96.  
 bleckeri, 251.  
 blennius, 233.  
 blepephrus, 109.  
 blochii, 219, 285.  
 blosyrus, 109.  
 blythii, 250, 267, 441, 445.  
 blythipicus, 318.  
 boarmia, 61.  
 boarmiaria, 61.  
 boarmoides, 70.  
 bocana, 64.  
 bocconrti, 113.  
 boddaerti, 229.  
 boelama, 271.  
 boelang, 191.  
 boga, 264.  
 boisduvali, 95.  
 bola, 270.  
 boleophthalmus, 229.  
 bolina, 98.  
 bolinoides, 60.  
 bolus, 175.  
 bombax, 177.  
 bombi, 22.  
 bombus, 122.  
 bombyliformis, 88.  
 bombyx, 80.  
 bonneaudi, 130.  
 boops, 216.  
 bootanicus, 45.  
 bootes, 165.  
 bopyrus, 21.  
 borneonensis, 170.  
 borolia, 76.  
 boschasiana, 137.  
 bostrichthys, 230.  
 bothriorhynchus, 298.  
 botia, 272.  
 bots, 48.  
 botyodes, 54.  
 botys, 51.  
 bowersii, 419.  
 brachelytra, 113.  
 brachybasis, 47.  
 brachydiscus, 175.  
 brachycera, 48.  
 brachyotus, 406, 425.  
 brachyplatys, 43.  
 brachyplecta, 175.  
 brachypodius, 362.  
 brachypteryx, 362.  
 brachyrhynchus, 42, 249.  
 brachysoma, 221, 425.  
 brachyurus, 363, 318.  
 braconoides, 39.  
 bractcalis, 56.

brahma, 93, 112.  
 brahmea, 77.  
 brahminus, 298.  
 bregmaceros, 248.  
 brevicaudatus, 365.  
 breviculus, 141.  
 brevifissum, 113.  
 brevilinea, 78.  
 brevirostris, 219, 282,  
     384.  
 brevis, 136.  
 brevivitta, 84.  
 brevivittalis, 61.  
 briada, 70.  
 brihaspa, 64.  
 briophila, 76.  
 broderipia, 170.  
 brodiei, 407.  
 bronchocela, 333.  
 brooksi, 373.  
 brotia, 154.  
 brownii, 143.  
 brunia, 86.  
 brunnea, 87.  
 brunneicephala, 400.  
 brunneo-pectus, 391.  
 brunneus, 369, 373.  
 bubalina, 459.  
 bubalus, 461.  
 bubo, 406.  
 buccata, 304.  
 buccinulus, 140.  
 buehanani, 205, 232, 252,  
     253, 255, 265, 269.  
 buchanga, 378.  
 buddha, 77, 107.  
 budytes, 375.  
 buffonis, 261.  
 bufo, 145, 296.  
 bulbosa, 142.  
 bulbulus, 152.  
 bulbus, 176.  
 bulis, 95.  
 bulla, 140.  
 bullia, 143.  
 bungarus, 311.  
 buplus, 398.  
 busiris, 90.  
 butalis, 53.  
 butastur, 405.  
 buteo, 405.  
 butleri, 44.  
 butorides, 398.  
 burmana, 178, 333.  
 burmanica, 133, 155, 256,  
     265, 353, 386, 408.  
 burmanorum, 157, 178.  
 burmanus, 130, 169, 177,  
     253, 258, 267, 298.  
 buzura, 62.  
 bynoensis, 225.  
 bythinia, 157.

## C.

cabera, 58.  
 cacomantes, 379.  
 cacoseelis, 108.  
 cadambæ, 76.  
 caddis cases, 48.  
 cadelli, 102.  
 cadphises, 84.  
 cæculus, 232.  
 calata, 156.  
 calataria, 60.  
 calatus, 253.  
 calisparsa, 68.  
 canurus, 21.  
 cærulea, 43, 69.  
 cæruleo-maculatus, 237.  
 cæruleo-punctatus, 244.  
 cærulescens, 151, 318, 403.  
 cæruleus, 130, 311, 363.  
 cæsalis, 54.  
 cæsius, 378.  
 cahira, 91.  
 caieta, 69.  
 calenas, 389.  
 calais, 103.  
 calamaria, 299.  
 calamistrata, 56, 74.  
 calamotrophia, 64.  
 calappoides, 29.  
 calathus, 178.  
 calbasu, 263.  
 calcar, 42.  
 calcaratus, 375.  
 calcariter, 188.  
 calcearia, 62.  
 calcite, 14.  
 caldusalis, 54.  
 calefaciens, 67.  
 calesia, 67.  
 caletoralis, 54.  
 calias, 172.  
 calidris, 395.  
 caligatus, 405.  
 caliginosa, 69.  
 caliginosalis, 65.  
 caligula, 79.  
 calinaga, 107.  
 callerebia, 95.  
 calliana, 91.  
 callichlora, 53.  
 callichrous, 256.  
 callidea, 43.  
 callidryas, 104.  
 callidula, 88.  
 callitera, 170.  
 calligramma, 83.  
 callionymus, 232.  
 calliope, 372.  
 callirhoe, 97.  
 callista, 133.  
 callithea, 147.  
 calloplus, 348.  
 callophis, 311.  
 callopietra, 108.  
 callopietria, 72.  
 callospira, 144.  
 calluella, 293.  
 callula, 292.  
 callyna, 70.  
 callyodon, 247.  
 calogramma, 75.  
 caloperdix, 394.  
 calophrinus, 291.  
 calophylla, 133.  
 caloptinus, 45.  
 caloramphus, 350.  
 calorifica, 67.  
 calornis, 386.  
 calotes, 333.  
 calpe, 71.  
 calpenia, 86.  
 calpurnus, 153.  
 calvus, 402.  
 calyculus, 170.  
 calymnia, 89.  
 calyptomena, 354.  
 calyx, 164.  
 cama, 99.  
 camadeva, 101.  
 cambaiensis, 389.  
 camdeo, 93.  
 camena, 94.  
 camorta, 102.  
 campana, 67.  
 camposternus, 111.  
 canaliculata, 143.  
 canalifera, 170.  
 canaliferalis, 64.  
 canarium, 152.  
 cancellana, 153.  
 cancellata, 156.  
 cancellatus, 152, 197.  
 cancer, 31.  
 cancila, 261.  
 cancella, 157.  
 cancrivora, 469.  
 canerus, 113.  
 candelaria, 39.  
 candida, 53, 146, 406.  
 candidus, 396.  
 candyra, 78.  
 canente, 346.  
 canerkes, 85.  
 canescens, 395.  
 canicapillus, 349.  
 caniceps, 409, 415.  
 canidia, 104, 143.  
 canis, 406.  
 canius, 257.  
 canna, 72.  
 canningi, 397.  
 canorus, 359.  
 cantao, 43.  
 cantharis, 109.  
 cantharus, 142.  
 canthecona, 43.



- cantiana, 293.  
 cantori, 313.  
 cantoria, 343.  
 cantorii, 349.  
 cantoris, 113, 228, 320,  
     331.  
 capella, 65.  
 caperata, 231.  
 capessens, 173.  
 capetusaria, 62.  
 capila, 91.  
 capillacea, 134.  
 capissa, 87.  
 capitalis, 380.  
 capitaneus, 151.  
 capitum, 175.  
 capnodes, 65.  
 capra, 469.  
 caprata, 371.  
 capreata, 57.  
 caprilia, 58.  
 caprimulgus, 68, 355.  
 capucinus, 111.  
 capulus, 158.  
 caput-serpentis, 153.  
 cara, 361.  
 caradrina, 74.  
 caranea, 68.  
 caraux, 216.  
 carbo, 402.  
 carcineutes, 353.  
 cardisoma, 29.  
 cardita, 133.  
 cardium, 131, 132.  
 cardui, 97.  
 caretta, 344.  
 carica, 86.  
 carinatus, 31, 208, 313,  
     328.  
 carinifera, 145.  
 carmatica, 292.  
 carmaticum, 118.  
 carnelian, 13.  
 carneola, 146, 153, 166.  
 carnifex, 29.  
 carpodacus, 385.  
 carpophaga, 388.  
 carutta, 213.  
 caryophyllacea, 399.  
 casarka, 399.  
 cassidula, 173, 178.  
 cassitrite, 12.  
 castabala, 87.  
 castalia, 99.  
 castanea, 65.  
 castanealis, 65.  
 castanearia, 63.  
 castaneicauda, 377.  
 castaneiceps, 377.  
 castaneipars, 78.  
 castaneus, 129, 356.  
 castanopterum, 407.  
 castor, 90, 105.  
 castra, 174.  
 casyapa, 105.  
 catacanthus, 43.  
 catamita, 88.  
 catastoma, 175.  
 catena, 142.  
 catenaria, 57, 60.  
 catephia, 69.  
 catilla, 101.  
 catinata, 108.  
 catinus, 149.  
 catla, 265.  
 catocala, 69.  
 catocaloides, 69.  
 catoxantha, 112.  
 catus, 151.  
 caudata, 85.  
 caudatior, 418.  
 caudatus, 368.  
 caurica, 153.  
 causia, 173.  
 caustoloma, 62.  
 cavasius, 251.  
 cavatus, 359.  
 cavifrons, 231.  
 cavia, 83.  
 cecidomyia, 48.  
 celena, 74.  
 celebicum, 41.  
 celeia, 81.  
 celerena, 85.  
 celerio, 89.  
 celinde, 101.  
 cellulose, 21.  
 cenia, 258.  
 cenis, 85.  
 cenobita, 27.  
 centaurus, 91, 100.  
 centropus, 360.  
 centrotus, 39.  
 centrotypus, 39.  
 cephaloxys, 49.  
 cephalus, 264.  
 cephise, 66.  
 cerace, 53.  
 ceraupes, 113.  
 ceramensis, 195.  
 cerastioides, 73.  
 ceratella, 53.  
 ceratophthalma, 39.  
 cerberus, 394.  
 cercopis, 38.  
 cercotrichus, 371.  
 cerebialis, 21.  
 cerithiopsis, 150.  
 cermatia, 32.  
 ceroplesis, 109.  
 cerostoma, 53.  
 certhia, 77, 362.  
 certior, 67.  
 cerura, 81.  
 cervaria, 53.  
 cervina, 79, 74, 75, 81, 89.  
 cervicalis, 65.  
 cervinaria, 57, 58, 62.  
 cervineps, 355.  
 cervinus, 375.  
 cervulus, 158.  
 ceryle, 333.  
 cerynia, 39.  
 cestoda, 29.  
 cethosia, 98.  
 cetra, 165.  
 ceylanica, 137.  
 ceylonensis, 133, 151, 382,  
     406.  
 ceylonica, 397.  
 ceyx, 353.  
 chaca, 257.  
 chacunda, 274.  
 chamorrois, 372.  
 cherocampa, 89.  
 cherodes, 63.  
 cherops, 243.  
 chertodon, 199.  
 chalcococyx, 359.  
 chalcoparia, 361.  
 chalcophaps, 389.  
 chalcopyrite, 49.  
 chalcosia, 84.  
 chalcostetha, 361.  
 chalybeus, 386.  
 chalybea, 111.  
 chalybealis, 61.  
 chalybearia, 56.  
 chalybeata, 69, 70, 71.  
 chalybeatus, 76, 264.  
 chama, 131.  
 chamunda, 91.  
 chandala, 92.  
 chandica, 95.  
 chandra, 99.  
 chaon, 105.  
 chaptia, 378.  
 charadrius, 393.  
 charaka, 96.  
 charcharius, 284.  
 charicles, 105.  
 charltoni, 391.  
 charonia, 97.  
 charpentieri, 161.  
 chasmina, 75.  
 chatamba, 84.  
 chatareus, 203.  
 chatocessus, 274.  
 chaus, 473.  
 chaya, 91.  
 checupa, 73.  
 checla, 405.  
 cheilinus, 244.  
 cheilodipterus, 195.  
 cheiromeles, 138.  
 chela, 271.  
 chelidon, 357.  
 chelidorhynx, 382.  
 chelmo, 200.  
 chelonia, 343.  
 chelura, 84.  
 chelyconus, 151.

- chemnitzii, 128, 133, 149.  
 chersydus, 304.  
 chettusia, 393.  
 chevana, 99.  
 chibia, 379.  
 childreni, 98, 113.  
 chilena, 78.  
 chilo, 61.  
 chimarroale, 410.  
 chinensis, 47, 94, 112, 137,  
 157, 296, 367, 391, 412.  
 chinquis, 390.  
 chione, 133.  
 chiragra, 25.  
 chiron, 105.  
 chirurgus, 396.  
 chitala, 277.  
 chiton, 171.  
 chitra, 340.  
 chlamys, 126.  
 chlenias, 114.  
 chlorea, 66.  
 chlorine compounds, 11.  
 chlorion, 118.  
 chloris, 114, 319, 353.  
 chlorocephalus, 370.  
 chloroleuca, 53.  
 chlorolophus, 347.  
 chlorophæa, 360.  
 chloproptera, 388.  
 chloropus, 391, 396.  
 chlorurus, 244.  
 chnaura, 56.  
 choinix, 172.  
 choirhyuchus, 272.  
 chola, 267.  
 chondrodite, 14.  
 choreutes, 53.  
 chorinemus, 217.  
 chorinus, 32.  
 chorodna, 63.  
 christatella, 333.  
 christianæ, 174.  
 chromalaria, 65.  
 chromus, 90.  
 chrysæglia, 86.  
 chrysalis, 165.  
 chrysame, 147.  
 chrysea, 365, 373.  
 chrysippus, 101.  
 chrysochroa, 112.  
 chrysocoris, 43.  
 chrysogaster, 479.  
 chrysogenys, 361.  
 chrysolineata, 60.  
 chrysopelea, 305.  
 chrysophanus, 93.  
 chrysophlegma, 347.  
 chrysophrys, 206.  
 chrysorabdia, 87.  
 chrysorrhœum, 361.  
 chrysostoma, 169.  
 chrysotænia, 192.  
 churia, 72.  
 churinga, 86.  
 cibaritis, 99.  
 cicada, 40.  
 ciconia, 397.  
 cidaria, 56.  
 cidosa, 79.  
 ciliata, 69.  
 ciliatus, 197.  
 ciligera, 75.  
 cilium, 75.  
 cimex, 40.  
 cimicodes, 63.  
 cinclorhynchus, 364.  
 cineta, 155, 208.  
 cincticauda, 273.  
 cinctimannus, 40.  
 cinerascens, 88, 295, 416.  
 cinerea, 89, 393, 395, 397.  
 cinerealis, 55.  
 cinerata, 56.  
 cinereus, 220, 278, 366,  
 381, 396, 421.  
 cingulatus, 42.  
 cinnamomea, 74, 77, 398.  
 circe, 84, 133.  
 circia, 400.  
 circinata, 85.  
 circulitaria, 62.  
 circumdata, 83.  
 circumsignata, 67.  
 circumsuta, 126.  
 circus, 405.  
 cirrhina, 265.  
 cirrhites, 206.  
 cirrochroa, 97, 98.  
 cirrosus, 142.  
 cispia, 88.  
 cissa, 387.  
 cisticola, 373.  
 cistopus, 181.  
 citrella, 52.  
 citrina, 84, 104, 364.  
 citrinus, 228.  
 cixius, 39.  
 cladocera, 24.  
 clanculus, 169.  
 clanga, 404.  
 clanis, 89.  
 clara, 83.  
 clarias, 257.  
 clarus, 142.  
 clathurella, 142.  
 clausilia, 176, 177.  
 clavata, 39, 43.  
 clavifera, 66.  
 clemathe, 102.  
 clementia, 134.  
 cleobis, 93.  
 cleonora, 104.  
 cleonus, 109.  
 cleora, 61.  
 cleosiris, 88.  
 clerodendrella, 52.  
 clerome, 101.  
 cleryi, 151.  
 climacterica, 172.  
 clinia, 99.  
 cloanthus, 105.  
 clostophis, 166.  
 clotho, 89.  
 clupea, 275.  
 clupeoides, 271.  
 clypeata, 27.  
 clysesalis, 54.  
 clytia, 68.  
 clytus, 109.  
 cnacalis, 98.  
 enejus, 92.  
 cobitidina, 272.  
 coccinatus, 140.  
 coccinea, 87.  
 coccinella, 107.  
 coccineus, 126.  
 coccus, 37.  
 coccytes, 359.  
 cochineal, 36.  
 cochimensis, 133, 242, 256.  
 cochoa, 375.  
 cocles, 97.  
 cocotropus, 209.  
 cocteau, 330.  
 cocytodes, 69.  
 cocytus, 99, 100.  
 codonodes, 175.  
 cœlestina, 39.  
 cœlophyllus, 428.  
 cognebertii, 42.  
 cohærens, 68.  
 coilia, 274.  
 coitor, 213.  
 colaca, 91.  
 coleopterorum, 33.  
 colias, 103.  
 colimba, 103.  
 colina, 154.  
 collaris, 122, 300, 463.  
 collita, 86.  
 collocalia, 357.  
 colluroides, 380.  
 colobesthes, 39.  
 coluber, 300, 388.  
 colubrinus, 279.  
 columba, 152.  
 columbella, 148.  
 columella, 98.  
 columnaris, 157.  
 comata, 358.  
 comatula, 19.  
 comatus, 351.  
 combusta, 81.  
 combustaria, 61.  
 comibæna, 60.  
 commersonii, 194.  
 commixtus, 378.  
 communis, 391.  
 comorensis, 172.  
 comosa, 67.  
 comparataria, 61.

- complanata, 134.  
 complicata, 83.  
 compluvialis, 172.  
 compositata, 57.  
 compressa, 17, 129.  
 compressus, 178, 217.  
 comprimens, 65.  
 compsozona, 300.  
 compta, 75.  
 concatenalis, 54, 56.  
 concatenata, 210.  
 conceinna, 144.  
 concolor, 83, 151, 368,  
     397, 419.  
 concordalis, 56.  
 concreta, 353.  
 conchyalis, 55.  
 conchyliis, 53.  
 condanurus, 304.  
 conducens, 71.  
 conferta, 77.  
 confinis, 173.  
 confluent, 73.  
 confucius, 100.  
 confusa, 75.  
 conica, 158.  
 conifer, 38.  
 conjugata, 72.  
 conjungens, 172.  
 conoidalis, 146.  
 conoidea, 167.  
 conscitalis, 65.  
 consepta, 173.  
 consignata, 74.  
 consimilis, 45, 75, 98.  
 consobrina, 69.  
 consociellus, 64.  
 consorta, 83.  
 conspersa, 39, 76.  
 conspersus, 48.  
 conspicua, 68, 135.  
 constantia, 96.  
 constellata, 71, 73.  
 constricta, 71.  
 constrictus, 136.  
 conta, 252.  
 contenta, 67.  
 contiguata, 61.  
 continua, 70.  
 contra, 385.  
 contractus, 141.  
 contrarius, 158, 176.  
 conula, 173.  
 conus, 151.  
 convallata, 172.  
 convectaria, 59.  
 convexisculus, 178.  
 convolvuli, 90.  
 coon, 105.  
 copper, sulphantimonite  
     of, 11.  
 copris, 112.  
 copyschus, 371.  
 coprocycla, 108.  
 cor, 133.  
 coracias, 350.  
 coracina, 357.  
 coralliophaga, 131.  
 corbicula, 132.  
 corbis, 132.  
 corbula, 137.  
 cordiformis, 136.  
 core, 102.  
 coremia, 57.  
 coriacea, 344.  
 coriscium, 52.  
 cornigera, 147.  
 cornucopiae, 168.  
 cornu-venatorium, 164.  
 coromanda, 353, 406.  
 coromandeliana, 47.  
 coromandelianus, 399.  
 coromandelicus, 391.  
 coromandus, 359, 398.  
 coronata, 31, 66, 143, 319,  
     358.  
 coronatus, 169, 373, 386.  
 coronaxis, 151.  
 corotia, 62.  
 corricanus, 130.  
 corrugata, 155.  
 corrugatus, 130, 170.  
 corsula, 236.  
 cornudum, 11.  
 corusca, 84.  
 corvus, 387.  
 corydalla, 375.  
 corydon, 351.  
 corymicea, 62.  
 corynodes, 108.  
 coryta, 97.  
 corythus, 89.  
 cosmocarta, 38.  
 cosmophila, 70.  
 cosmopteryx, 52.  
 cossa, 87.  
 cossoides, 82.  
 cossus, 76.  
 costalis, 63, 65, 74, 75, 111,  
     169.  
 costellaria, 147.  
 costellifer, 141.  
 costimaculata, 58, 70.  
 costinotalis, 65.  
 costistrigaria, 62.  
 costigera, 73, 82.  
 costipannaria, 57.  
 cotanda, 99.  
 cotio, 269.  
 cottonis, 96.  
 coturnix, 391.  
 cotuza, 67.  
 cotyle, 356.  
 couana, 343.  
 cracalis, 63.  
 crambus, 61.  
 crangon, 25.  
 crania, 124.  
 craspedonta, 108.  
 crassa, 102.  
 crassatella, 133.  
 crassiceps, 21.  
 crassicolis, 21, 324, 338.  
 crassicornalis, 55.  
 crassipennis, 73.  
 crassispinum, 196.  
 crastea, 102.  
 crateropus, 368.  
 crawangensis, 44.  
 crawfirdi, 347, 390.  
 creataria, 61.  
 creatonotus, 82.  
 creberrima, 66.  
 crebriatata, 131.  
 crecca, 100.  
 crenella, 128.  
 crenilabris, 336.  
 crenularis, 112.  
 crenulata, 45, 144, 147.  
 crenulifera, 30.  
 crepidula, 158.  
 crepitans, 392.  
 crepuscularis, 68.  
 cretaceous group, 3.  
 creusa, 85.  
 cribraria, 153.  
 cribrilrata, 117.  
 crienula, 79.  
 eriniger, 368.  
 erinigera, 373.  
 eriocoris, 108.  
 crispata, 153, 166.  
 crispatus, 130, 166.  
 crispifrons, 365.  
 crispisulcatus, 130.  
 cristatrix, 71.  
 cristatus, 89, 380, 451, 479.  
 crocale, 104.  
 crocatus, 164.  
 crocea, 72.  
 crochroa, 373.  
 crocidura, 440.  
 crocina, 167.  
 crocisa, 122.  
 crocodilus, 335.  
 crocopterata, 63.  
 crocopus, 387.  
 creesi, 81.  
 cromileptes, 188.  
 cruciata, 43.  
 crucibulum, 158.  
 cruciferum, 31.  
 crucigera, 43.  
 cruentaria, 63.  
 cruentata, 147.  
 cruentatum, 361.  
 cruentatus, 299.  
 crumenophthalmus, 216.  
 crusalis, 362.  
 crypsirhina, 387.  
 cryptocephalus, 108.  
 cryptogramma, 133.

cryptomphalus, 161.  
 cryptosoma, 174.  
 cryptothella, 83.  
 cryptotympana, 40.  
 crysogaster, 34.  
 ctenocardia, 132.  
 etesia, 94.  
 euchia, 277.  
 cucullata, 86, 125, 387.  
 cucullatus, 166, 363.  
 cucullia, 72.  
 cuculoides, 407.  
 cuculus, 359.  
 encumerina, 147.  
 culapa, 95.  
 culex, 49.  
 culibata, 38.  
 culicipeta, 373, 382.  
 cultellus, 136.  
 cuma, 146.  
 cumingiana, 178.  
 cumingii, 138, 144, 148.  
 cuneata, 47, 57, 134.  
 cuneatus, 135.  
 cuniculus, 44.  
 cuora, 337.  
 cuprea, 67, 70, 74.  
 cuprealis, 56.  
 cuprearia, 57, 61.  
 cupreipennis, 102.  
 cuprina, 75, 76.  
 cuprinalis, 56.  
 cuproviridialis, 64.  
 curculionides, 43.  
 curetis, 94.  
 curius, 106.  
 curonicus, 393.  
 cursitans, 373.  
 cursoria, 44.  
 curta, 320.  
 curvilinea, 68.  
 curviplena, 73.  
 cutia, 377.  
 cyane, 98, 372.  
 cyanea, 363, 380.  
 cyaneacula, 372.  
 cyanella, 329.  
 cyaneus, 363.  
 cyanicollis, 108.  
 cyanipennis, 108.  
 cyaniventris, 369.  
 cyanivitta, 68.  
 cyanocephalus, 408.  
 cyanocincta, 363.  
 cyanocincta, 318.  
 cyanoderma, 365.  
 cyanophlictis, 290.  
 cyanopogon, 370.  
 cyanotis, 349.  
 cyanonoptera, 377.  
 cyanura, 108.  
 cycindela, 114.  
 cyclaspis, 175.  
 cyclemys, 337.

cyclohelix, 164.  
 cyclopelta, 42.  
 cyclophorus, 163, 164.  
 cyclopides, 92.  
 cyclopteryx, 64.  
 cyclosia, 84.  
 cyenus, 101.  
 cydalima, 55.  
 cygna, 83.  
 cygnus, 75.  
 cylindra, 147.  
 cylindrelloidea, 177.  
 cylindrica, 140.  
 cylindrophis, 298.  
 cylindrus, 176.  
 cylo, 96.  
 cyllota, 67.  
 cymbium, 138, 221.  
 cymborhynchus, 354.  
 cymbulum, 140.  
 cynoglossus, 249.  
 cynomolgus, 477.  
 cynonycteris, 425.  
 cynopterus, 424.  
 cynthia, 80, 97.  
 cyornis, 382.  
 cyprea, 152, 153.  
 cypricardia, 134.  
 cyprinoides, 276.  
 cypselus, 357.  
 cyrena, 132.  
 cyrestis, 97.  
 cyrtacanthacris, 45.  
 cyrtodactylus, 332.  
 cyrtotrachelus, 109.  
 cysticercus, 21.  
 cythera, 142.  
 cytherea, 133.

## d.

dabarita, 73.  
 daboia, 312.  
 dabryi, 361.  
 dactylus, 147.  
 dafila, 400.  
 dalader, 42.  
 dalei, 47.  
 dalhousiae, 354.  
 dalima, 63.  
 dalpada, 43.  
 damaris, 96.  
 damascensis, 395.  
 damata, 81.  
 damoalis, 51.  
 damodara, 81.  
 damor, 76.  
 dan, 91.  
 danais, 101, 102.  
 danava, 99.  
 dangila, 264, 270.  
 daniconius, 269.  
 danio, 270.

danna, 92.  
 daos, 102.  
 dapha, 103.  
 daphnis, 90.  
 daraba, 56.  
 darada, 103.  
 darapsa, 90.  
 daraxa, 99.  
 darjelinensis, 431.  
 darlisa, 98.  
 darpa, 90.  
 dasahara, 90, 104.  
 dasarada, 105.  
 dasychira, 83.  
 dasypogon, 49.  
 datnioides, 198.  
 daudini, 352.  
 dauma, 364.  
 daurica, 268.  
 davisoni, 307, 350, 398,  
 405.  
 dayana, 30, 303.  
 dayanum, 176.  
 debis, 95.  
 debitaria, 62.  
 deceptatura, 63.  
 decetia, 62.  
 decissima, 75.  
 declinata, 75.  
 decora, 122.  
 decorata, 63, 76.  
 decoratus, 89, 146.  
 decumanus, 418.  
 decussata, 57, 61, 128,  
 167.  
 decussatus, 193.  
 defecta, 87.  
 deficiens, 67.  
 deflorata, 69, 135.  
 deione, 102.  
 delecta, 74.  
 delesserti, 149.  
 deliaria, 59.  
 delias, 102, 103.  
 delicata, 87.  
 deloleon, 105.  
 delphinula, 169.  
 delphis, 100, 101.  
 deltæ, 129.  
 deltoides, 64.  
 demiegretta, 398.  
 demodex, 33.  
 dendrochelidon, 358.  
 dendrocitta, 386.  
 dendroconus, 151.  
 dendrocygna, 399.  
 dendrophila, 362.  
 dendrophis, 305.  
 dentalium, 139.  
 dentata, 60, 337.  
 dentatrix, 88.  
 dentatus, 89, 113, 152.  
 denticulata, 70.  
 dentilinea, 82.

- dentilinearis, 65.  
 dentilineata, 61.  
 dentisignata, 60.  
 deodata, 95.  
 depressa, 126, 168, 337.  
 depressaria, 53.  
 desa, 101.  
 descombesi, 102.  
 deshayesii, 147.  
 designata, 75.  
 destructor, 48.  
 dereas, 104.  
 dermatocera, 165.  
 dermatochelys, 344.  
 dermestiuu, 147.  
 deva, 91.  
 devaca, 104.  
 dextrorsa, 175.  
 dhanada, 91.  
 dharma, 75, 77.  
 dholaria, 62.  
 diacamma, 118.  
 diacanthus, 213.  
 diadema, 98, 319, 428.  
 diademoides, 96.  
 diana, 362.  
 dianthecia, 73.  
 diaphana, 85.  
 diapromorpha, 108.  
 diardi, 360, 472.  
 dibamus, 329.  
 diceum, 361.  
 diebelia, 53.  
 dichoceros, 350.  
 dichocrosis, 56.  
 dichromia, 64.  
 dicuriformis, 379.  
 didactylum, 209.  
 didrichsenii, 173.  
 dienece, 93.  
 diffusaria, 59.  
 difrea, 95.  
 digama, 86.  
 digramma, 196.  
 dilabiatu, 150.  
 dilatatus, 31.  
 dilaticollis, 43.  
 dilectus, 92.  
 dilipa, 99.  
 dilophyrus, 332.  
 dimidiata, 118, 122.  
 dimidiatus, 244.  
 diminuta, 45.  
 dindymus, 42.  
 dineutes, 114.  
 dinumma, 70.  
 diocles, 104.  
 diodon, 283.  
 diorea, 101.  
 diphilæa, 84.  
 diphilus, 105.  
 diphos, 135.  
 diphtera, 76.  
 diplodon, 173.  
 dipplommatica, 166.  
 dipsas, 93, 306.  
 dipterygia, 75.  
 dirempta, 60.  
 dirtea, 100.  
 discalis, 73, 81.  
 discerptalis, 55.  
 discibrunnea, 76.  
 discinigra, 82.  
 discinota, 81, 83.  
 discisigna, 87.  
 discisignata, 73.  
 discispilaria, 62.  
 discispilota, 100.  
 discissa, 60.  
 discistriga, 65, 68, 72, 87, 90.  
 discivitta, 83.  
 discocephala, 49.  
 discognathus, 262.  
 discoidalis, 172.  
 discolor, 362.  
 discophora, 101.  
 discospilata, 63.  
 disjuncta, 86.  
 dispar, 261.  
 disparilis, 128.  
 dispensata, 61.  
 disrupta, 85.  
 dissectus, 74.  
 dissemuroides, 379.  
 dissemurus, 379.  
 dissimilis, 105, 157.  
 dissimulata, 60.  
 dissita, 60.  
 distans, 151.  
 distermina, 167.  
 distincta, 76.  
 distinctaria, 60.  
 distoma, 20.  
 distorta, 73, 87.  
 distrigalis, 55.  
 diurnalis, 54.  
 diurnaria, 62.  
 divaca, 103.  
 divakara, 87.  
 divapala, 60.  
 divaricata, 133.  
 diversa, 45.  
 diversalis, 56, 65.  
 divisa, 72, 82, 83, 86.  
 divisalis, 65.  
 divisaria, 58.  
 divodasa, 91.  
 divulsa, 67.  
 dobsoni, 380.  
 dochmius, 22.  
 docirava, 57.  
 dodona, 95.  
 dolgoma, 87.  
 dolichoidea, 90.  
 dolium, 148.  
 dolon, 101.  
 dolopia, 92.  
 domesticus, 33.  
 domicola, 356.  
 domina, 222.  
 dominica, 75.  
 donax, 135.  
 d'orbigny, 156.  
 dorsalis, 86, 119.  
 dorsata, 119.  
 dorylloidea, 118.  
 dorylus, 117.  
 dorynra, 331.  
 dosinia, 134.  
 dotata, 67, 69.  
 doubledayi, 102, 105.  
 dougalli, 401.  
 dracena, 326.  
 draco, 332.  
 draconis, 225.  
 drapetodes, 58.  
 dreata, 84.  
 drepane, 202.  
 drepanodes, 62.  
 drepanoides, 79.  
 drillia, 112.  
 dromas, 391.  
 drona, 101.  
 drumila, 95.  
 druna, 91.  
 drusia, 96.  
 dryas, 89.  
 drymocapthus, 266.  
 drymoica, 373.  
 dubia, 377, 393.  
 dubiosa, 142.  
 dubitaria, 69.  
 dubius, 43.  
 ducalis, 39, 91.  
 duclosiana, 148.  
 ductaria, 57.  
 dudu, 99.  
 dudusa, 82.  
 dugong, 446.  
 dukhunensis, 374.  
 dulcis, 72.  
 dulcissima, 71.  
 dules, 196.  
 dumetorum, 372.  
 dundubia, 40.  
 dunkeri, 167.  
 dupana, 80.  
 duplexa, 80.  
 duplicans, 72.  
 duplicata, 150, 157.  
 dussumieri, 231.  
 dussumieria, 276.  
 duvaucellii, 351.  
 dyctiophora, 39.  
 dydereus, 42.  
 dyrtæ, 95.  
 dysallactæ, 51.  
 dysdercus, 42.  
 dysoni, 135.  
 dytiscus, 114.  
 dulcis, 87.

duodenalis, 22.  
durga, 100.

# e.

- earlii, 368.  
earth oil, 14.  
ebenus, 147.  
ebulea, 54.  
ebuleata, 63.  
eburna, 143.  
eburneigutta, 62, 88.  
eburneus, 151.  
echana, 64.  
echerius, 95.  
echinata, 144, 145.  
echinatus, 209.  
echinococcus, 21.  
ectunctio, 261.  
edeni, 445.  
edeniana, 338.  
edentula, 218.  
edila, 372.  
edocla, 85.  
eductana, 53.  
edusa, 103.  
edwardsii, 30, 80.  
efflorescens, 69.  
egens, 86.  
egeon, 95.  
egista, 98.  
egnasia, 65.  
elanga, 268.  
elanus, 405.  
elaphis, 300.  
elaps, 309.  
eldi, 456.  
electrina, 125.  
elegans, 26, 29, 88, 144,  
153, 381.  
eleonora, 58.  
electris, 230.  
elephas, 447.  
elephenor, 105.  
elgina, 405.  
elis, 118.  
elisa, 177.  
ella, 90.  
elliotti, 321.  
elongata, 17, 134, 336.  
elongatum, 132.  
elphos, 62.  
elpis, 92.  
eltola, 91, 94.  
elva, 93.  
elymnias, 96.  
emarginata, 71, 113.  
emberiza, 384.  
emenes, 118.  
emeria, 369.  
emersaria, 58.  
emissaria, 59.  
emittens, 82.  
emma, 331.  
emodes, 98.  
emyda, 341.  
emys, 336.  
endropia, 63.  
engina, 148.  
engraulis, 273.  
enhydrina, 321.  
enhydria, 303.  
enispe, 101.  
ennea, 177.  
ennomos, 63.  
ennomosaria, 62.  
entella, 86.  
entomogramma, 68.  
eonycteris, 425.  
eozoon, 17.  
epæromia, 45.  
ephippium, 127, 240.  
ephippus, 292.  
ephyrodalis, 65.  
epibulus, 244.  
epicles, 93.  
epiclimes, 38.  
epicopeia, 84.  
epicrium, 288.  
epijarbas, 93.  
epiladena, 107.  
epimuta, 100.  
epiona, 99.  
episcopalis, 146.  
episcopus, 397.  
episemida, 74.  
episparis, 65.  
epixanthus, 31.  
epona, 153.  
epycides, 105.  
equestris, 47.  
equitalis, 82.  
equula, 218.  
erasmia, 84.  
erastria, 72.  
ercheia, 70.  
erebomorpha, 63.  
erebusaria, 63.  
eremita, 127.  
eressa, 82.  
erethistes, 251.  
ergolis, 97.  
erinaceus, 149.  
eriphia, 31.  
eristalis, 49.  
erites, 96.  
erithonius, 105.  
eronia, 104.  
erosia, 58.  
erota, 97.  
erpornis, 377.  
erycina, 133.  
erygia, 69.  
erylus, 91.  
erymanthis, 98.  
erythaca, 383.  
erythrinus, 385.  
erythrocephalus, 354, 377.  
erythrodon, 247.  
erythrogaster, 361.  
erythrogeus, 366, 408,  
421.  
erythrognathus, 360.  
erythropleura, 373.  
erythroptera, 365.  
erythropus, 403.  
erythropygia, 356, 386.  
erythrorhyncha, 361.  
erythrosipilus, 227.  
erythrosteria, 383.  
erythrura, 384.  
erythrurus, 313.  
esacus, 392.  
eschata, 64, 76.  
esperii, 102.  
estigena, 77.  
estrelda, 384.  
eterusia, 85.  
ethion, 93.  
ethope, 96.  
etolus, 94.  
euagoras, 41.  
eucharis, 102.  
euchelus, 170.  
euchera, 63.  
euchlore, 112.  
euchromia, 82.  
eudamippus, 101.  
eudendrium, 17.  
eudromias, 393.  
eudynamys, 359.  
eugenei, 362.  
euglyphis, 55.  
eulabes, 386.  
eulima, 150.  
eulophotes, 397.  
eumelia, 59.  
eumolphas, 100.  
eumolpus, 94, 108.  
eupatorius, 408.  
eupatorus, 112.  
eupithecia, 57.  
euplæa, 102.  
euplectella, 17, 24.  
euplexia, 73.  
euplexoptera, 45.  
euplocamus, 390.  
euplocia, 88.  
euprepides, 328.  
euproctis, 83, 84.  
euriptera, 154.  
euripus, 98.  
eurois, 73.  
europa, 95.  
eurybatus, 109.  
eurybrachys, 39.  
eurycereus, 360.  
euryclealis, 54.  
eurykamus, 354.  
eurymene, 63.  
eurynorhynchus, 395.

- eurypylus, 105.  
 eurystomus, 359.  
 eurytela, 97.  
 eurytion, 88.  
 euryzona, 307.  
 eusarcoris, 43.  
 euschema, 85.  
 euschemoides, 85.  
 eusemia, 88.  
 euspiza, 385.  
 eusthenes, 42.  
 eutelia, 71.  
 euthymius, 101.  
 eutrichocheles, 26.  
 eutropichthys, 258.  
 evan, 105.  
 evanida, 156.  
 evelina, 99.  
 evippe, 104.  
 evolans, 262.  
 evulsalis, 61.  
 exacutus, 177.  
 exasperata, 147.  
 excafactoria, 391.  
 excavata, 108, 133.  
 excellens, 164.  
 excisa, 134.  
 exclusa, 59, 61.  
 excubitor, 85.  
 exigua, 150, 329.  
 exilis, 166.  
 eximius, 122.  
 exocætus, 261.  
 exolescens, 131.  
 exostoma, 269.  
 exotica, 72.  
 expansa, 235.  
 expansus, 164.  
 exsanguis, 75.  
 extensa, 65, 80.  
 exterior, 75.  
 externa, 73.  
 extinatorium, 158.  
 extranea, 75.  
 exul, 173.  
 exultans, 15.  
 exustus, 178.  
  
**f.**  
 fabius, 101.  
 fairbaulti, 142.  
 falcata, 53, 65.  
 falcataria, 63.  
 falcatella, 52.  
 falcinellus, 398.  
 falcipennis, 77.  
 falco, 402.  
 falconaria, 58.  
 falcula, 199.  
 farri, 191.  
 fartoidea, 177.  
 fascellina, 65.  
 fascialis, 61.  
 fasciata, 58, 62, 69, 73,  
     76, 87, 320, 397.  
 fasciatum, 228.  
 fasciatus, 178, 189, 205,  
     239, 306, 312.  
 fasciolaris, 21.  
 fasciolaria, 146.  
 fastigiata, 173.  
 fastigiatum, 158.  
 fastigium, 146.  
 fatalis, 47.  
 fatua, 107.  
 faunrix, 68.  
 fayreriana, 320.  
 feddeni, 130, 165, 175.  
 feddenianus, 166.  
 feducia, 68.  
 feliceps, 230.  
 feliciata, 59.  
 felina, 152.  
 felinaria, 57.  
 felinia, 66.  
 felis, 470.  
 fenestraria, 60, 62.  
 fenestrata, 71.  
 femisea, 68.  
 ferania, 303.  
 ferrea, 85, 372.  
 ferrifasciata, 86.  
 ferrina, 45.  
 ferruginaria, 57.  
 ferruginea, 38, 77, 81, 442.  
 ferrugineus, 382, 390, 412.  
 ferruginosum, 366.  
 fessorius, 118.  
 festiva, 75.  
 fiber, 401.  
 ficula, 148.  
 ficus, 86, 148.  
 fieldii, 103.  
 figurata, 73, 86.  
 filamentosa, 146.  
 filamentosus, 199.  
 filodes, 55.  
 filosa, 147, 176.  
 fimbriata, 59, 61, 132.  
 fimbriatum, 131.  
 finlaysoni, 368.  
 firmamentum, 71.  
 fissurella, 170.  
 fistularia, 237.  
 flabellicornis, 84.  
 flabellifera, 67, 87.  
 flammatra, 73.  
 flammamaxillaris, 361.  
 flammifer, 381.  
 flata, 39.  
 flava, 118.  
 flavala, 56.  
 flavalis, 82.  
 flaveolus, 368, 381.  
 flavescens, 47, 83, 326,  
     368.  
 flavibasalis, 54.  
 flavicollis, 86, 398.  
 flavicosta, 87.  
 flavicostana, 53.  
 flavidiventris, 384.  
 flavidus, 151.  
 flavigula, 461.  
 flavilabris, 161.  
 flavimacula, 83.  
 flavinucha, 347.  
 flavipennis, 44.  
 flavirostris, 201.  
 flavistigma, 74.  
 flavivena, 73.  
 flavivenosa, 87.  
 flaviventris, 369, 373.  
 flavi-viridis, 373.  
 flavo-ceruleus, 189.  
 flavofasciata, 52.  
 flavolimbatus, 105.  
 flavolineatus, 204.  
 flavolivacea, 373.  
 flavomaculata, 56, 114.  
 flavomarginatus, 282.  
 flavula, 76, 368.  
 flegyas, 95.  
 flexuosus, 39.  
 floralis, 119.  
 florea, 119.  
 florens, 76.  
 florescens, 76.  
 fluctuosa, 155.  
 fluminalis, 139, 446.  
 fluviatilis, 151, 170, 393.  
 fodina, 67.  
 foliaceus, 131, 161.  
 folliculorum, 33.  
 folus, 90.  
 forabilis, 172.  
 fordonia, 303.  
 formica, 117.  
 formosa, 97, 104.  
 formosus, 35, 311, 340, 435.  
 forskalia, 170.  
 forsteri, 206.  
 fortissima, 73.  
 fortisulcata, 137.  
 fortunatus, 81.  
 fortunei, 150.  
 fossalatus, 170.  
 fossilis, 258.  
 fossores, 118.  
 foveolatus, 170.  
 fragilis, 131.  
 francesie, 156.  
 francie, 100.  
 francica, 358.  
 francisca, 96.  
 franeolinus, 391.  
 frankii, 97.  
 franklini, 349.  
 fraterna, 168.  
 freja, 94.  
 frenatalis, 56.

frenatus, 210, 330.  
 fringillarius, 403.  
 frithi, 79.  
 frontalis, 31, 362, 371, 461.  
 fronticinctus, 305.  
 frugalis, 66.  
 frustrillum, 167.  
 fucata, 384.  
 fulgida, 91.  
 fulgora, 39.  
 fulguraria, 63.  
 fulguratus, 163.  
 fulgurita, 63, 81.  
 fulica, 396.  
 fuliginosa, 372, 440.  
 fullonica, 69.  
 fulminans, 108.  
 fulminatus, 142.  
 fulva, 399, 429.  
 fulvicollis, 388.  
 fulvida, 70.  
 fulvidorsalis, 55.  
 fulvocincta, 142.  
 fulvohirta, 82.  
 fulvotænia, 67.  
 fulvus, 121, 191, 393.  
 funiculata, 156.  
 furcatus, 117.  
 furcellata, 43.  
 furcifera, 71.  
 furcillatus, 176.  
 fusca, 128, 231, 273, 290,  
 396.  
 fuscesens, 89.  
 fuscicollis, 402.  
 fusco-flavescens, 369.  
 fusco-guttatus, 190.  
 fuscum, 154.  
 fuscus, 380, 385, 395.  
 fusiformis, 49, 176.  
 fusus, 142, 152.  
 fylla, 95.  
 lytchei, 85, 391.

### g.

gabata, 175.  
 gachua, 238.  
 gadirtha, 70.  
 gadus, 139.  
 gænoptica, 176.  
 gagata, 259.  
 gagara, 254.  
 galactites, 149.  
 galathea, 26, 103.  
 galathea, 161.  
 galba, 103.  
 galena, 10.  
 galeocerdo, 285.  
 galeodes, 35.  
 galeopithecus, 441.  
 galerita, 429.  
 galeritus, 351.

galeruca, 108.  
 gallicrex, 396.  
 gallina, 42.  
 gallinago, 391.  
 gallinula, 152, 391, 396.  
 gallus, 390.  
 gamasus, 33.  
 gambrinus, 97.  
 gammistes, 191.  
 gammoides, 67.  
 gampsorrhynchus, 364.  
 gana, 90.  
 gandarites, 56.  
 gandhara, 86.  
 ganesa, 77, 105.  
 ganesella, 175.  
 ganga, 99.  
 gangarides, 77.  
 gangene, 223.  
 gangetica, 137, 178, 258.  
 gangeticus, 281, 335.  
 gangrenosa, 153.  
 ganisa, 84.  
 gannata, 58.  
 garæus, 63.  
 gargetta, 82.  
 garoensis, 427.  
 garrulax, 367.  
 garrulus, 387.  
 garuda, 100.  
 garzetta, 397.  
 gastralis, 55.  
 gastrochaena, 138.  
 gastropachoides, 67.  
 gaudama, 331.  
 gaurena, 76.  
 gauropicoides, 349.  
 gaurus, 460.  
 gavæus, 460.  
 gazza, 219.  
 gecinulus, 348.  
 gecko, 329.  
 gelasimus, 31.  
 gelechia, 53.  
 gelida, 64, 76.  
 gelochelidon, 401.  
 gemina, 84.  
 gemma, 172.  
 gemmans, 68.  
 gemmata, 39.  
 gemmifera, 59, 71.  
 gemmulifera, 144.  
 gemoniella, 52.  
 generosus, 130.  
 genusa, 83.  
 geocichla, 364.  
 geoffroyi, 393.  
 geometra, 59.  
 geometralis, 55.  
 geometres, 56.  
 geomys, 336.  
 geophila, 171.  
 gerarda, 303.  
 geronticus, 398.  
 gerres, 198.  
 ghanam, 197.  
 gharialis, 335.  
 ghoria, 86.  
 gibba, 141.  
 gibberifrons, 400.  
 gibberulus, 152.  
 gibbia, 133.  
 gibbosa, 146.  
 gibbula, 170.  
 gibbus, 193.  
 gigantea, 357.  
 giganteus, 389, 412.  
 gigas, 22, 86, 89, 131, 174.  
 gilviberbis, 64.  
 ginginianus, 385.  
 giuris, 226.  
 glaber, 106.  
 glabra, 112.  
 glacialis, 84.  
 gladiator, 31.  
 glans, 147, 151.  
 glanyeus, 82.  
 glareola, 392, 395.  
 glauca, 49, 149.  
 glaucaria, 60.  
 glaucescens, 84.  
 glaucidium, 407.  
 glaucinans, 70.  
 glaucippe, 104.  
 glauconomya, 137.  
 glaucopsis, 68, 84.  
 glaucus, 213, 229.  
 glenea, 109.  
 glessula, 172.  
 globosa, 138, 144, 149.  
 globulus, 153.  
 glomeris, 21.  
 gloriosa, 87, 90.  
 glorissæ, 75.  
 glottis, 395.  
 glottula, 75.  
 gluphisia, 82.  
 glutinosum, 288.  
 glycerion, 105.  
 glycyphana, 112.  
 glyphidodon, 242.  
 glyphodes, 54, 55.  
 glyphoglossus, 292.  
 glyptosternum, 259.  
 gnophos, 62.  
 goalpara, 95.  
 gobiodon, 227.  
 gobioides, 232.  
 gobius, 225.  
 godarti, 102.  
 goensis, 393.  
 gola, 92.  
 gomphosus, 246.  
 goniata, 91.  
 goniloba, 90.  
 goniograpsus, 29.  
 goniomphalus, 157.  
 goniosoma, 266.



gonisoma, 31.  
 gonitis, 70.  
 goniüs, 263.  
 gonodactylus, 25.  
 gonophora, 76.  
 gonyosoma, 305.  
 goongwaree, 255.  
 gopala, 90.  
 gopara, 82.  
 gordius, 22.  
 gordonii, 414.  
 gordonie, 173.  
 gorsuchius, 398.  
 gortyna, 74.  
 gouldie, 361.  
 gouldiana, 177.  
 govinda, 405.  
 gracilimanus, 31.  
 gracilis, 47, 171, 290, 319,  
 327, 373.  
 gracillaria, 52.  
 gracillima, 284.  
 graculus, 402.  
 gradata, 145.  
 gramineus, 313.  
 grammearia, 58.  
 grammica, 101.  
 grammodes, 67.  
 grandis, 42, 43, 83, 113,  
 333, 337, 350, 382.  
 granifera, 143, 144.  
 granosa, 128.  
 granulatus, 100, 286, 304.  
 granulosa, 291.  
 graphicus, 166.  
 graphiphora, 73.  
 grapholitha, 53.  
 grapsus, 29.  
 graptcephalus, 398.  
 graptodera, 108.  
 gratosalis, 56.  
 gratulator, 173.  
 graucalus, 380.  
 gravata, 67.  
 gravida, 165.  
 grayi, 398, 468.  
 grayii, 340.  
 gregalis, 66.  
 gressoria, 41.  
 griffithii, 142, 440.  
 grisea, 69, 70.  
 griseicapilla, 388.  
 griseipennis, 48.  
 griseus, 398.  
 grisola, 380.  
 grossa, 41.  
 grotea, 88.  
 grotei, 79, 82, 85, 102.  
 gruteri, 147.  
 grus, 394.  
 gryllotalpa, 45.  
 gryllus, 45.  
 gryphoides, 131.  
 guerini, 79.

guineaica, 135.  
 gularis, 361, 365, 368, 377.  
 gulgula, 385.  
 gulio, 250.  
 gurneyi, 363.  
 gurua, 255.  
 gutta, 12.  
 guttanivis, 70.  
 guttata, 146, 147, 353.  
 guttatum, 221.  
 guttatus, 191, 269, 329,  
 335, 365, 374.  
 guttifera, 87.  
 guttigera, 39.  
 guttularis, 40.  
 guttulata, 293.  
 gyas, 105.  
 gymnapistus, 208.  
 gymmodactylus, 331.  
 gymnomurena, 280.  
 gymmura, 143.  
 gyps, 402.  
 gyrans, 89.

## h.

hadena, 73.  
 hadenalis, 64.  
 hadeni, 102.  
 haemacephala, 350.  
 haematite, 12.  
 haematopus, 394.  
 haemorrhoida, 72.  
 haemorrhous, 369.  
 haesitans, 65.  
 hainesiana, 155.  
 haleyon, 353.  
 haliaetus, 404.  
 haliaria, 60.  
 haliastur, 405.  
 halicore, 446.  
 halicornaria, 17.  
 halientæa, 224.  
 haliotis, 170.  
 halirothius, 98.  
 halite, 11.  
 halitherses, 98.  
 halpe, 92.  
 hamiltonii, 236.  
 haminea, 140.  
 hammaticherus, 109.  
 hamodes, 68.  
 hanleyanus, 177.  
 hanria, 90.  
 hapalomys, 420.  
 hapalus, 172.  
 haplochilus, 262.  
 haplodactylus, 207.  
 haplomorpha, 18.  
 haplosonyx, 108.  
 hara, 97, 251.  
 harak, 206.  
 hardwickii, 39, 112.  
 hardwickii, 320, 370, 438.  
 harina, 104.  
 harisa, 91.  
 harita, 99.  
 harmonia, 107.  
 harpa, 116.  
 harpaetes, 354.  
 harpalus, 114.  
 harpax, 191.  
 harpia, 436.  
 harpiocephalus, 436.  
 harpodon, 260.  
 hasseltii, 323, 293, 304,  
 434.  
 hastatus, 404.  
 hastula, 150.  
 haughtoni, 165, 171, 174,  
 395.  
 haumela, 215.  
 hearseyana, 86.  
 hebraeus, 118.  
 hebomöia, 104.  
 hebra, 114.  
 hebreus, 151.  
 hebraicus, 246.  
 hecabe, 103.  
 hectarthrum, 113.  
 hector, 105.  
 hegesippus, 104.  
 helarctos, 462.  
 helcyra, 100.  
 helenus, 105.  
 helleri, 79, 90, 91, 175.  
 heliaconoides, 105.  
 heliastes, 243.  
 helicarion, 174.  
 helicifera, 173.  
 helicina, 68, 167.  
 helicolimax, 174.  
 heliconia, 86.  
 helictis, 464.  
 heliola, 153.  
 heliomanes, 109.  
 heliophobus, 74.  
 heliothis, 73.  
 helvetica, 393.  
 hemerophila, 61.  
 hemicardia, 132.  
 hemichelidon, 382.  
 hemichroma, 89.  
 hemicircus, 346.  
 hemicurus, 374.  
 hemidactylus, 330.  
 hemigymnus, 244.  
 hemina, 100.  
 hemiopta, 175.  
 hemiptera, 36.  
 hemipus, 380.  
 hemirhamphus, 261.  
 hemispherius, 39.  
 hemithearia, 60.  
 hemixus, 368.  
 hemmeroblemma, 67.  
 heniochus, 204.

- hepaticum, 20.  
 hepatizans, 65.  
 hepialus, 76.  
 heracula, 83.  
 herbitera, 78.  
 herculia, 56.  
 heri, 96.  
 herminia, 64.  
 hermonassa, 74.  
 herodias, 397.  
 herona, 99.  
 herpestes, 469.  
 hesione, 96.  
 hesperia, 91.  
 hesteria, 98.  
 hestia, 102.  
 hesudra, 86.  
 heteroblemma, 68.  
 heterocampa, 81.  
 heterodes, 55.  
 heterogyna, 116.  
 heteromera, 109.  
 heteronychus, 112.  
 heterorhina, 249.  
 hewitsoni, 94.  
 hexagonata, 306.  
 hexagonatus, 189, 301.  
 hexophthalma, 222.  
 hians, 124.  
 hiatula, 135.  
 hibisci, 53.  
 hierax, 403.  
 hierococyx, 359.  
 hierodula, 44.  
 hieroglyphica, 68.  
 hierte, 103.  
 hilarata, 60.  
 hiliaria, 104.  
 hiliaris, 45.  
 hilda, 101.  
 hima, 144.  
 himaehala, 96.  
 himalayensis, 387.  
 himalayica, 114.  
 himalayicus, 440.  
 himantopus, 396.  
 hinulia, 328.  
 hippo, 103.  
 hippocampus, 281.  
 hippocastanum, 145.  
 hippopus, 131.  
 hirsutus, 408.  
 hirundinicornis, 71.  
 hirundo, 152, 356.  
 hisboulis, 64.  
 hispida, 30.  
 hispidula, 164.  
 hispidulus, 44.  
 hispidus, 224.  
 histia, 84.  
 histrio, 153.  
 histrionica, 272.  
 histrionicus, 27.  
 hodgii, 347.  
 hodgsoni, 350, 356, 373.  
 holacanthus, 201.  
 holocentrum, 211.  
 holothuria, 20.  
 homalocephalum, 330.  
 homalopsis, 304.  
 homaloptera, 262.  
 homarus, 25.  
 homo, 479.  
 homochrous, 431.  
 homodes, 72.  
 homocercus, 42.  
 homoptera, 70.  
 honesta, 66, 173.  
 hoolock, 474.  
 hopei, 111.  
 hoplites, 31.  
 hoplopterus, 393.  
 hordonia, 98.  
 horeites, 372.  
 hornblende, 13.  
 horreorum, 356.  
 horrida, 144, 145.  
 horsfieldii, 85, 97, 298, 416.  
 hortulanus, 245.  
 hot springs, 7.  
 hotea, 43.  
 hottentota, 379.  
 howra, 75, 84.  
 hubneri, 85.  
 huechys, 40.  
 hulodes, 68.  
 humei, 29.  
 humeraria, 61.  
 humerosa, 155.  
 humilis, 167, 377, 389.  
 hungerfordiana, 156, 166,  
     173.  
 huttonella, 177.  
 huttoni, 175.  
 hyagriva, 96.  
 hyalimax, 174.  
 hyalina, 163.  
 hyalineata, 60.  
 hyalonema, 17.  
 hyas, 89.  
 hyblea, 71.  
 hyblæoides, 56.  
 hybocystis, 165.  
 hybrida, 401.  
 hydatina, 140.  
 hydræcia, 74.  
 hydrelia, 72.  
 hydrillodes, 64.  
 hydrinus, 303.  
 hydrocampa, 56.  
 hydrocena, 167, 168.  
 hydrochelidon, 401.  
 hydrocissa, 351.  
 hydrophasianus, 396.  
 hydroruis, 363.  
 hydrosaurus, 326.  
 hyekaphus, 456.  
 hylæ, 296.  
 hykeocarcinus, 29.  
 hylas, 89.  
 hylax, 92.  
 hylabates, 474.  
 hylomys, 443.  
 hylophila, 53.  
 hyloterpe, 384.  
 hymenaria, 62.  
 hymenia, 56.  
 hymenopus, 41.  
 hyotis, 126.  
 hypætra, 67.  
 hyparete, 103.  
 hypatula, 94.  
 hypena, 65.  
 hypenoides, 72.  
 hypercompa, 82.  
 hypermnestria, 69.  
 hypernaria, 65.  
 hyperythra, 62.  
 hypistes, 303.  
 hypocala, 69.  
 hypochroma, 61.  
 hypochlis, 98.  
 hypocyana, 69.  
 hypogrammica, 361.  
 hypoleuca, 69, 173.  
 hypoleucos, 380.  
 hypoleucus, 366, 395.  
 hypolycæna, 94.  
 hyponomenta, 53.  
 hypopyra, 68.  
 hypotanidia, 397.  
 hypothyms, 381.  
 hypotriorchis, 403.  
 hypoxantha, 382.  
 hypoxanthus, 383.  
 hypypasia, 66.  
 hypypocla, 98.  
 hypsa, 86.  
 hypselostoma, 176.  
 hypsipetes, 368.  
 hypsirhina, 303.  
 hyria, 59.  
 hyriaria, 59.  
 hyrtlhi, 245.  
 hystrix, 132, 281, 283, 422.

## i.

- ianthina, 179  
 ibis, 398.  
 icarius, 105.  
 ichthyactus, 400, 404.  
 ichthyura, 81.  
 ichthyurus, 111.  
 ictis, 94.  
 ictrix, 45.  
 ideopsis, 102.  
 idmais, 103.  
 ignescens, 79.  
 igneus, 381, 398.  
 ignipectus, 362.

- ignita, 71.  
 ignivorata, 58.  
 illattia, 74.  
 ilerda, 93.  
 iliacos, 118.  
 ilisha, 276.  
 illex, 168.  
 illisalis, 54.  
 illucida, 70.  
 iluza, 66.  
 imbuta, 72, 82.  
 immaculata, 40.  
 immaculatum, 165.  
 immaculatus, 374.  
 immundalis, 54.  
 imparata, 61, 72.  
 imparatalis, 64.  
 impellens, 72.  
 imperialis, 82, 107.  
 impetuosus, 122.  
 impingens, 70.  
 impleta, 82.  
 impressa, 108.  
 imprimata, 59.  
 impudica, 133.  
 inachis, 101.  
 inaequalis, 71.  
 inangulata, 68.  
 inaptaria, 60.  
 inara, 99.  
 inbricata, 128.  
 incarnata, 147, 169.  
 incarnatus, 43, 125, 146.  
 ineci, 138.  
 incertus, 409.  
 inchoata, 58.  
 incisalis, 54.  
 ineitata, 58.  
 inclusus, 48.  
 incognita, 350.  
 incoloralis, 54.  
 incomptus, 45.  
 inconcisa, 84.  
 indica, 41, 55, 73, 75, 76,  
     77, 81, 97, 103, 119, 147,  
     168, 173, 328, 340, 357,  
     371, 389, 396, 401, 417,  
     440, 445.  
 indicus, 35, 48, 81, 158,  
     181, 204, 212, 274, 355,  
     371, 373, 375, 384, 397,  
     401, 402, 405, 447.  
 indistincta, 87, 92, 104.  
 indistinctus, 169.  
 indranee, 406.  
 indrani, 91.  
 indrasana, 88.  
 indus, 405.  
 inermis, 32, 173.  
 inexacta, 70.  
 inextricata, 56.  
 infausta, 74.  
 infecta, 75.  
 inferualis, 89.  
 inflata, 132.  
 inflexa, 87.  
 inflexus, 136.  
 infligens, 70.  
 infraconstricta, 157.  
 inframarginata, 364.  
 infumatus, 357.  
 infundibulum, 169.  
 infusaria, 62.  
 ingens, 53.  
 inglisiana, 161.  
 ingrami, 173.  
 ingura, 71.  
 innocens, 72.  
 innominata, 358.  
 innotata, 45, 361.  
 inordinata, 82.  
 inornata, 39.  
 inoscularis, 131.  
 impendens, 173.  
 insidiator, 221.  
 insidiatrix, 219.  
 insignata, 59.  
 insignis, 49, 44, 84, 165,  
     177, 361, 388, 403.  
 insocia, 73.  
 insolitus, 82.  
 instabilis, 118.  
 insularis, 176, 388.  
 intemerata, 40.  
 interlineata, 291.  
 intermedia, 136, 155, 353,  
     380, 388, 391, 397.  
 intermedius, 361, 375.  
 intermixta, 86.  
 interplagata, 56.  
 interpres, 394.  
 interrupta, 82, 89, 152, 191.  
 interruptaria, 61.  
 intersepta, 72.  
 interserta, 87.  
 intestinalis, 311.  
 inustaria, 63.  
 iole, 79, 369.  
 iopas, 145.  
 iora, 370.  
 iphis, 29.  
 iphita, 42, 97.  
 iravadia, 156.  
 iravadica, 155.  
 irena, 371.  
 iridescens, 170.  
 iridosmine, 10.  
 iron, bisulphide of, 10.  
 ironstone, 12.  
 irrecta, 66.  
 irregularis, 76.  
 irridata, 56.  
 irrisans, 146.  
 irrorata, 57, 72.  
 irrorataria, 61.  
 irus, 134.  
 isa, 98.  
 isabella, 78, 153.  
 ismene, 90, 91, 99.  
 isocrates, 93.  
 isoteimon, 91, 92.  
 ispidula, 146.  
 issca, 98.  
 iva, 100.  
 ixalus, 295.  
 ixias, 104.  
 ixidia, 369.  
 ixos, 368.  
 ixulus, 377.  
  
**j.**  
 jabulara, 332.  
 jacobinus, 359.  
 jaculator, 203.  
 jade, 13.  
 jadra, 91.  
 jaguaralis, 55.  
 jahnu, 99.  
 jaina, 91.  
 jalindra, 94.  
 jambah, 98.  
 jannu, 93.  
 jana, 84.  
 janaka, 105.  
 jangala, 91.  
 janira, 127, 175.  
 jansenii, 246.  
 janus, 176.  
 jarbua, 196.  
 jason, 105.  
 jatius, 254.  
 java, 210.  
 javanensis, 278, 347, 383,  
     406.  
 javanica, 356, 381, 397,  
     398, 406, 412.  
 javanicus, 42, 305, 354,  
     360, 401, 405.  
 javensis, 347, 370.  
 jayadeva, 91.  
 jerdoni, 372.  
 jerdonia, 165.  
 jina, 99.  
 johnei, 192.  
 jopasalis, 54.  
 jouannetia, 138.  
 joudera, 391.  
 jubata, 333.  
 jugicostis, 155.  
 jugularis, 348.  
 julis, 246.  
 jumna, 99.  
 juncus, 392.  
 jumonia, 97.  
 juvenilis, 134.  
  
**k.**  
 kachuga, 338.  
 kakhienensis, 270.  
 kakhienis, 295, 374.

kakyensis, 420.  
 kaliella, 173.  
 kallima, 101.  
 kanuadena, 81.  
 kamarupa, 99.  
 kamorta, 94.  
 kamschatkensis, 372.  
 kanchil, 455.  
 kandarpa, 92.  
 kandura, 92.  
 kankena, 93.  
 kausa, 95.  
 kapirot, 277.  
 karennorum, 331.  
 karenorum, 175.  
 karsandra, 92.  
 katha, 86.  
 kashmira, 92.  
 kashmirensis, 97.  
 katinka, 80.  
 kausambi, 95.  
 kawarin, 245.  
 kerala, 76.  
 kerivoula, 435.  
 kesava, 100.  
 ketengus, 254.  
 ketupa, 406.  
 khasiana, 86, 90, 96, 99.  
 khasianus, 92.  
 kienerii, 405.  
 kingii, 133.  
 kinukurka, 93.  
 kiosquiformis, 146.  
 klugii, 102.  
 khunzei, 275.  
 kochi, 154.  
 koelreuteri, 229.  
 koenigi, 42.  
 kondulana, 93.  
 korama, 86.  
 korros, 301.  
 kosala, 77.  
 krananda, 58.  
 krishna, 101, 106.  
 kröyeri, 32.  
 kulilii, 289.  
 kumahensis, 173.  
 kuon, 465.  
 kurzianus, 167.

## 1.

labeo, 263.  
 labiata, 128.  
 labiatus, 242, 463.  
 labiosa, 155.  
 labiosus, 329.  
 laboriosa, 119.  
 labrella, 178.  
 labroides, 243.  
 laeca, 37.  
 laccoptera, 108.  
 lacera, 65.

laccessalis, 65.  
 lachesis, 90.  
 lactea, 81, 392.  
 lacteipennis, 52.  
 lacticinia, 85.  
 lactiferialis, 55.  
 lactinea, 82.  
 laeustralis, 54.  
 lada, 100.  
 ladadra, 87.  
 ladon, 91.  
 laelia, 83.  
 laesalis, 65.  
 laestrygonum, 106.  
 laeta, 66, 77, 104.  
 leviceps, 121.  
 la-vigatus, 44.  
 levis, 289.  
 laevissimus, 117.  
 lafoča, 17.  
 lafresnayi, 370.  
 lagela, 104.  
 lagena, 138.  
 lagocheilus, 164.  
 ligoptera, 66.  
 lagria, 111.  
 lagyra, 63.  
 lais, 96.  
 laius, 92.  
 lalage, 103, 380.  
 lamareckiana, 132.  
 lamareckii, 152, 153.  
 lamia, 109.  
 lambis, 152.  
 lambrus, 31.  
 laminata, 134.  
 lampas, 143.  
 lamprococcyx, 359.  
 lampyrus, 111.  
 lamta, 263.  
 lanbuca, 271.  
 lanceola, 65, 73.  
 lanceolata, 135, 372.  
 lanius, 380.  
 laogona, 98.  
 laomedia, 97.  
 lapemoides, 320.  
 laphria, 49.  
 lapithis, 94.  
 lapsariata, 57.  
 lar, 474.  
 larentia, 57.  
 larina, 157.  
 larus, 400.  
 larvata, 429.  
 larvivora, 372.  
 lata, 43.  
 lateralis, 69, 114, 295.  
 lates, 188.  
 latliburii, 39.  
 latiaris, 95.  
 laticauda, 41.  
 laticaudus, 284.  
 laticilia, 85.

laticostallis, 55.  
 latifascia, 78, 84.  
 latifasciata, 319.  
 latifasciatus, 104.  
 latimargo, 70.  
 latipennis, 77.  
 latipes, 43, 122.  
 latirostris, 382.  
 latirus, 145.  
 latistriga, 85.  
 lativitta, 69, 82, 84.  
 lativittaria, 57.  
 latro, 27.  
 latum, 132.  
 lasciocampa, 77.  
 lasiommatia, 95.  
 lasiotis, 452.  
 laugia, 90.  
 laurion, 84.  
 lazarus, 131.  
 lea, 103.  
 leayana, 108.  
 lebeda, 77, 98.  
 lebudea, 91.  
 lectula, 75.  
 lectularia, 42.  
 lectularius, 40.  
 leda, 96, 132.  
 ledes, 47.  
 ledra, 38.  
 leiostrix, 377.  
 leis, 107.  
 leisleri, 432.  
 lemnia, 107.  
 lemonias, 97.  
 lempigi, 407.  
 lena, 101.  
 lentiginosaria, 63.  
 lentus, 48.  
 leoninus, 476.  
 leopardinata, 57, 62.  
 leopardus, 102, 191.  
 leporensis, 245.  
 lepida, 73, 78, 146.  
 lepidalis, 55.  
 lepidea, 100.  
 lepidiota, 112.  
 lepidoccephalichthys, 272.  
 lepidurus, 243.  
 lepidus, 176.  
 lepisma, 36.  
 lepita, 97.  
 leporinus, 164.  
 leptaulax, 113.  
 lepthemis, 47.  
 leptobrachium, 293.  
 leptocirus, 106.  
 leptoconus, 151.  
 leptonyx, 464.  
 leptophylla, 428.  
 leptopoma, 165.  
 leptoptilos, 397.  
 leptorhina, 39.  
 leptus, 32.

- lepus, 422.  
 lepyrodes, 55.  
 leschenaulti, 352, 374.  
 lethrinus, 205.  
 leto, 79.  
 leucania, 75, 76.  
 leucinodes, 56.  
 leucocephala, 372.  
 leucocephalus, 398.  
 leucocerca, 381.  
 leucocyma, 96.  
 leucogaster, 243, 366, 401.  
 leucogastra, 384.  
 leucogenys, 378.  
 leucolophus, 367.  
 leucoma, 84.  
 leuconoe, 434.  
 leuconota, 77, 384.  
 leucophaea, 378.  
 leucophasis, 251.  
 leucophlebia, 89.  
 leucopleura, 242.  
 leucoptera, 399.  
 leucopterus, 387.  
 leucorhynchus, 380.  
 leucoryphus, 404.  
 leucospila, 74.  
 leucospilota, 85, 86.  
 leucostigma, 74.  
 leucothoe, 99.  
 leucotis, 387, 409.  
 leucura, 371, 372, 479.  
 levicula, 173.  
 levimana, 31.  
 lexias, 100.  
 libellago, 47.  
 libellula, 47.  
 libera, 85.  
 libythaea, 103.  
 libythea, 97.  
 lichenosa, 69, 104.  
 lida, 249.  
 lidderdalii, 105.  
 ligataria, 59.  
 lignicola, 176.  
 lilacina, 86.  
 lile, 275.  
 liliaua, 91.  
 lima, 2-9.  
 limacodes, 78.  
 limax, 174.  
 limbata, 39, 42.  
 limbatus, 261.  
 limbolalis, 56.  
 limbolaria, 62.  
 limborgii, 101, 102.  
 limenitis, 99.  
 limnaetus, 405.  
 limniace, 101.  
 limonidromus, 375.  
 limopis, 129.  
 limosa, 395.  
 limulus, 24.  
 lina, 108.  
 linchi, 357.  
 lindeni, 118.  
 lindia, 79.  
 lindsayi, 319.  
 linealis, 64.  
 lineata, 60, 89, 149, 155.  
 lineatipes, 75.  
 lineatonotella, 53.  
 lineatus, 151, 195, 215,  
     390, 395.  
 lineolata, 148, 168, 329.  
 lineosa, 77, 84, 89.  
 lingua-felis, 127.  
 lingula, 124.  
 linteola, 69.  
 liolepis, 335.  
 liratula, 168.  
 lirineta, 173.  
 liriopie, 24.  
 lisarda, 98.  
 lisias, 94.  
 lithada, 63.  
 lithocolletis, 52.  
 lithoconus, 151.  
 lithoglyphus, 156.  
 lithosia, 86.  
 litoralis, 231.  
 littoralis, 241.  
 littorina, 155.  
 liturata, 81, 89.  
 liventer, 405.  
 livia, 388.  
 livida, 113.  
 lividus, 151, 295.  
 lixus, 109.  
 lobatum, 118.  
 lobivanellus, 393.  
 locastra, 64.  
 locustella, 372.  
 loepa, 89.  
 lohita, 42, 94.  
 lokriah, 413.  
 lokrioides, 413.  
 lola, 79.  
 lomaptera, 112.  
 lonchodes, 44.  
 longicaudata, 95, 373, 378.  
 longicaudatus, 233, 420.  
 longiceps, 321.  
 longicollis, 21.  
 longicornis, 53, 117.  
 longimanus, 437.  
 longinus, 93.  
 longipalpis, 66.  
 longipennis, 65, 81, 82,  
     88, 358.  
 longipes, 275.  
 longirostra, 361.  
 longirostris, 352, 394.  
 longispina, 126.  
 longispinus, 32.  
 longitrorsum, 139.  
 lopaphus, 41.  
 lophia, 126.  
 lophiodes, 257.  
 lophopteryx, 81.  
 lophotes, 405.  
 lophotriorchis, 405.  
 lophura, 89.  
 loreata, 329.  
 loriculus, 409.  
 loripes, 132.  
 louisa, 101.  
 loxostoma, 52.  
 loxura, 94.  
 lubentina, 100.  
 lucanus, 112.  
 lucasi, 89.  
 lucida, 112.  
 lucidus, 199.  
 luciferalis, 54.  
 lucillialis, 56.  
 lucina, 132.  
 lucionensis, 380.  
 luctus, 427.  
 ludovicata, 59.  
 lugubris, 373, 359.  
 luleana, 78.  
 lumbricoides, 22.  
 luminosa, 68.  
 lunalis, 56.  
 lunaris, 246, 283.  
 lunatus, 354.  
 lunula, 200.  
 lunulata, 71.  
 lunulicardia, 132.  
 lunulifera, 94.  
 luponia, 153.  
 lureata, 108.  
 lurida, 143.  
 lutea, 62, 155, 231, 377.  
 luteata, 89.  
 luteiceps, 66.  
 luteola, 177.  
 lutescens, 83, 104.  
 luteus, 130.  
 lutianus, 191.  
 lutra, 461.  
 lutraria, 134.  
 luxiaria, 62.  
 luzonensis, 374.  
 lycæna, 92, 93.  
 lycænaria, 60.  
 lycænesthes, 93.  
 lycetus, 89.  
 lycimna, 63.  
 lycene, 87.  
 lycodon, 306.  
 lygniodes, 69.  
 lymantria, 83.  
 lymanæa, 177.  
 lymanodytes, 290.  
 lymanophila, 177.  
 lycornis, 355.  
 lynx, 153.  
 lyotodius, 31.  
 lysan, 218.  
 lysandra, 96.

## m.

- macacus, 475.  
 macaria, 58.  
 macariata, 60.  
 maccalis, 54.  
 maccellandii, 265.  
 maccellandii, 368, 415.  
 macei, 349, 380.  
 mægrigoriæ, 382.  
 machæramphus, 405.  
 machætes, 395.  
 machaon, 106.  
 maclophus, 377.  
 macoma, 135.  
 macrobrochis, 86.  
 macrocerus, 378.  
 macrocheraia, 42.  
 macrochlamys, 172, 173.  
 macrodon, 230.  
 macroglossa, 59.  
 macroglossus, 426.  
 macrolepidotus, 201, 267.  
 macromeris, 119.  
 macronemus, 204.  
 macrones, 250.  
 macrophthalma, 93.  
 macrophthalmus, 256.  
 macrops, 68, 301.  
 macropygia, 388.  
 macrorhynchus, 354.  
 macrosila, 90.  
 macrostoma, 154.  
 macrourus, 355, 371.  
 macrura, 25, 371.  
 macruraria, 61.  
 macularia, 59.  
 macularis, 107.  
 macularius, 328.  
 maculata, 57, 60, 71, 84,  
     86, 169, 223, 303, 328,  
     383.  
 maculatrix, 88.  
 maculatum, 148.  
 maculatus, 189, 294, 330,  
     332, 359, 362, 375.  
 maculiceps, 311.  
 maculicollis, 45.  
 maculifascia, 87.  
 maculiventris, 108.  
 maculosa, 85, 391.  
 maculosus, 467.  
 mæna, 388.  
 mænas, 79.  
 mæsa, 92.  
 mæsta, 147.  
 magilus, 146.  
 magna, 361, 362.  
 magnetite, 12.  
 magnifica, 86.  
 magnificus, 174.  
 magnirostris, 366, 373,  
     380, 382, 387, 392.  
 magnum, 365.  
 magracanthus, 209.  
 magur, 257.  
 mahadeva, 106.  
 mahamunda, 77.  
 mahasena, 83.  
 mahavira, 86.  
 mahesa, 99.  
 mahintha, 90.  
 mahrattensis, 319.  
 major, 89, 332.  
 malabarica, 386.  
 malabaricus, 190, 393.  
 malabaroides, 379.  
 malaccana, 135.  
 malaccensis, 348, 361, 368,  
     467, 469.  
 malacopteron, 365.  
 malaiensis, 405.  
 malayana, 90, 359.  
 malayanus, 164, 454, 462.  
 malayensis, 375, 378.  
 malayus, 41.  
 malelas, 96.  
 maliferalis, 55.  
 malleti, 142.  
 malleus, 127.  
 malsara, 96.  
 mamænus, 45.  
 mamestra, 74.  
 mamilla, 149.  
 mamma, 149.  
 mammillaris, 173.  
 mammillata, 149.  
 mananda, 98.  
 mandarina, 94.  
 mandelli, 377.  
 mangala, 91.  
 mangelia, 142.  
 mangois, 259.  
 manis, 411.  
 manlia, 69.  
 manluena, 93.  
 manmina, 275.  
 mannifera, 40.  
 manniferus, 37.  
 manouria, 336.  
 manyar, 383.  
 marathus, 99.  
 marcala, 58.  
 marchionatus, 151.  
 mardara, 83.  
 mareca, 400.  
 margariana, 291.  
 margarianus, 266.  
 margarita, 58, 102, 167.  
 margaritata, 63.  
 margariticola, 145.  
 margaritifera, 127, 144,  
     210.  
 margaritophorus, 307.  
 margaronia, 55.  
 margarya, 157.  
 margiana, 99.  
 marginalis, 42, 51, 72, 130.  
 marginata, 21, 57, 66, 72,  
     128, 363.  
 marginatum, 240.  
 marginatus, 245, 424.  
 marginella, 61, 148.  
 marginellus, 42.  
 marginicollis, 112.  
 marginulata, 144.  
 maria, 39.  
 mariæ, 147.  
 marianne, 104.  
 marmax, 100.  
 marmorata, 57, 85, 219,  
     280, 473.  
 marmoratus, 205, 224, 294.  
 marmorea, 88.  
 marmorealis, 55.  
 marmorinia, 65.  
 marratii, 143.  
 martabanensis, 156.  
 martaria, 57.  
 martes, 464.  
 martesia, 139.  
 marthesiusalis, 55.  
 martinialis, 54.  
 martinianus, 141.  
 maruca, 55.  
 maruetta, 396.  
 marulius, 238.  
 masalia, 72.  
 masoni, 38, 85, 92, 101,  
     102, 142, 151, 177, 428.  
 mastacembalus, 235.  
 mastax, 45.  
 mastygophora, 64.  
 materna, 69.  
 mathura, 83.  
 matrona, 47.  
 matthias, 91.  
 maturescens, 67.  
 matuta, 29, 98.  
 maulmain group, 2.  
 maulmeinensis, 104.  
 maura, 146, 158.  
 mauraria, 61.  
 mauritiana, 153.  
 mauritianus, 47.  
 maurus, 432.  
 maxima, 66.  
 may fly, 47.  
 mayo, 106.  
 mazza, 147.  
 meander, 39.  
 measles, 21.  
 mecodina, 65.  
 media, 401.  
 medio-canallata, 21.  
 mediofasciatus, 111.  
 mediovittaria, 57.  
 medius, 423.  
 medmaria, 57.  
 medus, 96.  
 meetana, 90, 98.  
 megachile, 122.

- megaderma, 439.  
 megalaima, 349.  
 megalomastoma, 165.  
 megalops, 276.  
 megalurus, 368.  
 megamera, 38.  
 megapodius, 392.  
 megarhynchus, 363.  
 megarus, 106.  
 megasema, 74.  
 megaspila, 63, 466.  
 megaspilaria, 61.  
 megastigma, 73.  
 meges, 106.  
 meigleptes, 348.  
 mekara, 95.  
 melampus, 93, 178.  
 melampygos, 216.  
 melaneus, 102.  
 melania, 155.  
 melanicterus, 385.  
 melanippe, 57.  
 melanippus, 101.  
 melanitis, 96.  
 melanauchen, 401.  
 melanocephalus, 369, 371, 398.  
 melanocheilus, 338.  
 melanogaster, 401, 402.  
 melanoides, 157.  
 melanoleuca, 102, 367.  
 melanoleucus, 403, 405.  
 melanolophus, 398.  
 melanope, 374.  
 melanopogon, 437.  
 melanops, 382.  
 melanopterus, 284, 405.  
 melanopus, 108, 397.  
 melanoschistus, 380.  
 melanosoma, 227, 318.  
 melanostictus, 296.  
 melanostigma, 367.  
 melanostoma, 149, 153, 155, 178.  
 melanotis, 375, 399.  
 melanotus, 200.  
 melanurum, 300.  
 melaptarus, 241.  
 melastigma, 262.  
 meleagrina, 127.  
 melicerte, 67.  
 melissa, 101.  
 melittia, 88.  
 mellifera, 119.  
 melo, 147.  
 melongena, 147.  
 melophus, 385.  
 membraria, 88.  
 membranaceus, 42.  
 memnon, 106.  
 menaka, 44, 45, 90.  
 menapia, 81.  
 mendicaria, 148.  
 mendicus, 41.  
 meninting, 353.  
 mentalis, 318.  
 mercatoria, 67.  
 mercuraria, 61.  
 meretrix, 133.  
 mergana, 62.  
 mergui group, 2.  
 merguensis, 167, 175.  
 meridionalis, 61.  
 merops, 352.  
 merra, 189.  
 merula, 377.  
 mesentina, 103.  
 mesodesma, 136.  
 mesoides, 92.  
 messaras, 98.  
 metachromata, 57.  
 metagonaria, 58, 65.  
 metallia, 74.  
 metamorphic rocks, 1.  
 metaphacaria, 63.  
 metaporia, 101.  
 metcalfei, 128.  
 methora, 96.  
 metroloas, 48.  
 miah, 98.  
 miastor, 48.  
 micans, 112.  
 micracanthus, 21.  
 microdon, 169.  
 microhyla, 292.  
 microlepidotus, 220.  
 microlepis, 203.  
 micronia, 58.  
 microphthalmus, 250.  
 microphyllum, 438.  
 microphyllus, 111.  
 microplerus, 359.  
 microsculpta, 156.  
 micropterus, 348.  
 mictis, 42.  
 midama, 84.  
 midamus, 102.  
 miles, 212, 361.  
 miletus, 95.  
 miliaris, 45.  
 milionia, 84.  
 militaris, 85, 254.  
 milne-edwardsii, 459.  
 milvus, 405.  
 mimela, 112.  
 mimus, 96.  
 mincrene, 106.  
 mineus, 76, 96.  
 mineusalis, 55.  
 miniatus, 190.  
 minima, 157.  
 minimus, 151, 401, 405, 426.  
 miniopterus, 436.  
 miniosata, 57.  
 mino, 254.  
 minor, 71, 112, 146, 365, 400, 421, 427.  
 minuta, 156, 219, 393, 395, 401.  
 minutellus, 61.  
 minuticornis, 71.  
 mirafra, 385.  
 miranda, 79.  
 mireza, 78.  
 miricallis, 55.  
 missippus, 98.  
 mitaria, 58.  
 mithila, 98.  
 mithuna, 87.  
 mitigata, 59.  
 mitis, 134.  
 mitra, 147.  
 mitralis, 129, 144.  
 mnasioides, 96.  
 mocha stones, 13.  
 mocha, 328.  
 modesta, 69, 75, 361.  
 modestus, 26, 243, 265, 274, 302, 307, 362.  
 modiola, 128.  
 mogilnik, 404.  
 mola, 266.  
 molecula, 173.  
 mollissima, 361.  
 molossus, 292.  
 moluccana, 155.  
 moluccanus, 24, 247.  
 moluccensis, 363.  
 molurus, 307.  
 monacanthus, 282.  
 moneta, 153.  
 mongolica, 393.  
 monile, 113.  
 monileca, 170.  
 monilifera, 157.  
 moniliferus, 176.  
 moniliger, 367, 382.  
 monilis, 74.  
 monoceros, 282.  
 monochondylea, 131.  
 monochroa, 112.  
 monochroum, 288.  
 monodactylus, 152.  
 monodonta, 170.  
 monogramma, 197.  
 monoleuca, 70.  
 monolitha, 70.  
 monopterus, 278.  
 monstrosa, 134.  
 montanus, 384.  
 monticola, 291, 364, 369.  
 monticolus, 355.  
 montivagus, 122, 435.  
 moolaiana, 94.  
 moolaka, 85.  
 moolata, 91.  
 moorei, 59, 63.  
 morar, 269.  
 moreletiana, 163.  
 morenia, 338.  
 mori, 80.

morosella, 64.  
 morpheus, 90.  
 mortoni, 330.  
 moschata, 465.  
 motacilla, 371.  
 mouhoti, 108.  
 mouhotii, 337.  
 mouletiana, 157.  
 mrigala, 265.  
 mucosus, 301.  
 mucronata, 75.  
 mugil, 236.  
 mulloides, 204.  
 multicaudata, 100.  
 multident, 198.  
 multigutta, 85.  
 multiguttata, 82.  
 multilinealis, 54.  
 multimaculata, 306.  
 multipunctaria, 62.  
 multisquamosus, 142.  
 multistriatum, 132.  
 multistrigaria, 63.  
 multistrigata, 77.  
 multivittata, 82.  
 munia, 383.  
 munipurensis, 364.  
 murena, 279.  
 murenesox, 278.  
 murenichthys, 278.  
 murdava, 91, 92.  
 murdjan, 211.  
 murex, 141.  
 muricata, 144.  
 muricola, 435.  
 muricolaria, 63.  
 murina, 440.  
 murinalis, 64.  
 murilda, 77.  
 mus, 417.  
 musanga, 468.  
 muscicoloraria, 61.  
 muscipeta, 381.  
 muscosaria, 62.  
 muscularia, 62.  
 musica, 145.  
 musicus, 371.  
 musiva, 145.  
 mustelinus, 151.  
 mustilia, 77.  
 mutabilis, 313.  
 mutans, 84.  
 mutatus, 117.  
 muticus, 389.  
 mutilatus, 331.  
 mycale, 100.  
 mycalesis, 96.  
 mycteria, 397.  
 mycterizans, 305.  
 mygdon, 67.  
 mygmimia, 119.  
 myiomela, 371.  
 myiophonus, 362.  
 myops, 67.

myra, 29.  
 myrina, 94.  
 myriodon, 206.  
 myripristis, 211.  
 myristica, 128.  
 myrmeleon, 48.  
 myrrha, 97.  
 myrteta, 58.  
 mystaceus, 333.  
 mystacophanus, 349.  
 mystica, 70.  
 mysticata, 59.  
 mythimna, 75.  
 mytilus, 128.  
 myurus, 150.  
 myxornis, 365.  
 myzanthé, 362.

## N.

nada, 95.  
 nadina, 103.  
 nanina, 70.  
 naevia, 404.  
 naga, 90.  
 nahara, 66.  
 nair, 464.  
 naja, 308.  
 najabula, 88.  
 nakula, 100.  
 nala, 96.  
 nalua, 194.  
 nama, 98, 103, 193.  
 nana, 166.  
 nanda, 77.  
 nandina, 98, 263.  
 nandus, 205.  
 nanus, 359.  
 naphtha, 14.  
 napu, 455.  
 narada, 94, 100.  
 naraka, 104.  
 nararia, 71.  
 narasingha, 96.  
 narathura, 94.  
 narinari, 287.  
 naritus, 283.  
 narkondami, 351.  
 nasa, 49.  
 nassa, 143, 157.  
 natica, 149.  
 natron, 14.  
 naucum, 140.  
 nautilus, 179.  
 navicella, 168.  
 naxa, 83.  
 naxia, 67.  
 naxiacoides, 74.  
 nebularia, 147.  
 nebulosa, 74, 87, 133, 173.  
 nebulosus, 326.  
 necho, 101.  
 necroscia, 45.  
 nectarophila, 361.  
 nette, 99.  
 negatalis, 54.  
 neglecta, 362, 380.  
 neglectus, 381.  
 nehereus, 260.  
 neilgherriensis, 95.  
 neilli, 264.  
 neleyunda, 57.  
 nelete, 104.  
 nemacheilus, 273.  
 nemertes, 20.  
 nemorhædus, 459.  
 nemoricola, 386, 394.  
 neochera, 88.  
 neophron, 95.  
 neoppe, 95.  
 neopus, 405.  
 neorina, 101.  
 neornis, 373.  
 nepalensis, 109.  
 nepcha, 69.  
 nephila, 34.  
 nephlopteryx, 64.  
 nephropsis, 25, 26.  
 nephthya, 18.  
 neptalis, 55.  
 neptis, 99.  
 neptunus, 31.  
 nerice, 82.  
 nerissa, 103.  
 nerita, 169.  
 neritina, 168.  
 neritoidea, 142.  
 nesimachus, 100.  
 nesippus, 101.  
 nesokia, 417.  
 nessus, 89.  
 nettapus, 399.  
 neuria, 75.  
 neurobasis, 47.  
 neurothemis, 47.  
 newara, 96.  
 nicea, 100.  
 nicetas, 95.  
 nicobarensis, 429.  
 nicobarica, 98, 132, 166,  
 167, 171, 361, 442.  
 nicobaricus, 106, 151, 171,  
 329, 389, 424.  
 nicobariensis, 104, 201,  
 291, 377, 300, 392, 429.  
 nicotia, 96.  
 niger, 108.  
 nigra, 25, 279.  
 nigrescens, 84.  
 nigricans, 205, 353.  
 nigricapitatus, 366.  
 nigriceps, 109, 365, 380.  
 nigricollis, 385.  
 nigricornis, 42.  
 nigricostata, 148.  
 nigrifrons, 82.  
 nigrigenis, 347.



nigripennis, 38.  
 nigripes, 118.  
 nigripinnis, 217.  
 nigrirostris, 39.  
 nigrisigna, 72.  
 nigrispinosus, 111.  
 nigrivena, 64.  
 nigriventris, 42.  
 nigrocincta, 142, 319.  
 nigrocinctus, 302.  
 nigrocuprea, 74.  
 nigrofasciatus, 271.  
 nigrolinealis, 55.  
 nigromarginata, 125.  
 nigrosigna, 73.  
 nigro venosa, 22.  
 nigroviridis, 76.  
 nigrovittata, 61.  
 nigrovittatus, 291.  
 nigrum, 73.  
 niguzaria, 62.  
 niligiricus, 176.  
 niloticus, 169.  
 niltava, 382.  
 nina, 103.  
 ninox, 408.  
 niolha, 144.  
 nipalenis, 76.  
 nipalensis, 101, 351, 356,  
 362, 365, 377, 387, 406,  
 465.  
 niplauda, 97.  
 niphe, 98.  
 nireus, 109.  
 nishada, 87.  
 niscolor, 359.  
 nisoniades, 104.  
 nissa, 93.  
 misus, 401.  
 nitidula, 52.  
 nitidulus, 420.  
 nivea, 86.  
 niveigutta, 53.  
 niveus, 136.  
 niviferana, 53.  
 nobilia, 58.  
 nobilis, 32, 40, 43, 77,  
 146, 151.  
 noctula, 432.  
 noctuoides, 67.  
 nodalis, 47.  
 nodulosum, 154.  
 nolasena, 71.  
 nomius, 106.  
 nonagria, 76.  
 nora, 58.  
 notata, 67.  
 notatus, 198, 242.  
 notodonta, 81.  
 notonecta, 40.  
 notopsis, 245.  
 notopterus, 277.  
 nourmahal, 101.  
 novacula, 137.

novara, 102.  
 novare, 53.  
 novarana, 53.  
 novem-carinatus, 328.  
 novemdecimnotata, 108.  
 novempunctatus, 109.  
 nubecula, 87.  
 nubes, 75.  
 nubifascia, 87.  
 nubifera, 67.  
 nubila, 75.  
 nubilosa, 147.  
 nuchalis, 366.  
 nudens, 153, 178.  
 uncula, 129.  
 nudans, 77.  
 nudaria, 87.  
 nudipes, 441.  
 nudosus, 142.  
 numenes, 84.  
 numenius, 395.  
 nummifer, 224.  
 nunus, 227.  
 nuria, 268.  
 nuthalli, 300.  
 nyctalemon, 88.  
 nyctelius, 98.  
 nyctemera, 85.  
 nycteridium, 331.  
 nycticebus, 474.  
 nycticorax, 398.  
 nyctiornis, 352.  
 nyctipao, 68.  
 nyctiphanes, 90.  
 nymphalis, 100, 104.  
 nyroca, 400.  
 nyssia, 78.

## O.

oatesi, 363.  
 obeliscus, 147, 150, 154,  
 156, 169.  
 obesus, 130.  
 objectaria, 61.  
 obliqua, 65.  
 obliquaria, 58, 63.  
 obliquisignata, 57.  
 obliterans, 68.  
 oblitterata, 61.  
 oblivascens, 69.  
 obliviaria, 59.  
 oblonga, 117.  
 oblongus, 198, 217.  
 obscura, 38, 42.  
 obscurata, 56.  
 obscurus, 42, 43, 364, 380,  
 408, 479.  
 obsoleta, 83, 87, 92.  
 obstructa, 76.  
 obtecta, 138.  
 obtectaria, 62.  
 obtusa, 80, 154, 168.

obtusata, 58.  
 obtusum, 172.  
 obtusus, 177.  
 occipitalis, 347, 353.  
 ocella, 91.  
 ocellata, 59, 153, 338.  
 ocellatus, 43.  
 ocellifera, 82, 117.  
 ochracea, 72, 306, 349.  
 ochracealis, 64.  
 ochraceiceps, 366.  
 ochraceus, 368.  
 ochrealis, 56.  
 ochrocephalus, 368.  
 ochromelas, 351.  
 ochropetra, 73, 74.  
 ochropus, 395.  
 ocinaria, 81.  
 octavialis, 56.  
 octogonum, 139.  
 octomacularis, 55.  
 ocularis, 64.  
 oculata, 43.  
 ocullea, 391.  
 oecypoda, 30.  
 odonata, 47.  
 odonestis, 77.  
 odontodes, 69.  
 odontoptera, 63.  
 odontopus, 42.  
 oecophora, 55.  
 oedinemus, 392.  
 oenone, 97.  
 oldhami, 175.  
 oligostigma, 55.  
 oliva, 116.  
 olivacea, 343, 369, 382.  
 olivaceum, 361.  
 olivaceus, 328, 366, 420.  
 olivascens, 92.  
 olivea, 72.  
 olivieri, 27.  
 olyra, 255.  
 omadius, 111.  
 omasscus, 114.  
 omiza, 63.  
 ommatophora, 68.  
 omphalotropis, 167.  
 ompheltesalis, 51.  
 onchidium, 178.  
 onclia, 67.  
 oniscus, 24.  
 oniticellus, 112.  
 onpape, 106.  
 onthophagus, 112.  
 onustana, 53.  
 onustus, 158.  
 onychoprion, 401.  
 onyx, 94.  
 opalaria, 60.  
 opalina, 99.  
 opalinalis, 54.  
 opatrum, 111.  
 opeas, 171.

ophiana, 99.  
 ophichthys, 279.  
 ophidiores, 69.  
 ophiocephalus, 231, 238.  
 ophiodes, 67.  
 ophis, 164.  
 ophisma, 67.  
 ophites, 306.  
 ophiusa, 67.  
 ophthalmicata, 60.  
 ophthalmodes, 62.  
 opisthoporus, 165.  
 opomala, 45.  
 oporabia, 57.  
 optatura, 66, 70.  
 oresia, 71.  
 oramin, 210.  
 orbicularia, 74.  
 orbicularis, 53, 88, 168,  
 195.  
 orbis, 202.  
 orbonalis, 56.  
 orcella, 446.  
 oreicola, 372.  
 oreocincla, 364.  
 oreskios, 354.  
 oreta, 80.  
 orgygia, 83.  
 orientale, 52, 143.  
 orientalis, 82, 89, 118, 132,  
 191, 249, 350, 372, 392,  
 406.  
 orinoma, 96.  
 oricalotes, 334.  
 oriolus, 67, 371.  
 orithyia, 97.  
 orixa, 95.  
 ornata, 59, 156, 305, 321.  
 ornattissima, 71.  
 ornatum, 31.  
 ornatus, 206, 226, 434.  
 ornithoptera, 105.  
 ornix, 52.  
 orocetes, 364.  
 orosialis, 64.  
 orseis, 93.  
 orthoceras, 172.  
 orthorhinus, 366.  
 orthosia, 73.  
 orthotomus, 372.  
 orudiza, 58.  
 oryra, 153.  
 oryzarum, 169.  
 oscitans, 398.  
 osica, 76.  
 osicerda, 58.  
 osmotreron, 388.  
 osmylus, 48.  
 ossigera, 68.  
 ossonoba, 70.  
 ostentalis, 56.  
 osteochilus, 264.  
 osteogeniosus, 254.  
 ostralegus, 394.

ostrea, 125.  
 othona, 94.  
 otiosa, 70.  
 otocompsa, 369.  
 otogyps, 402.  
 otreca, 96.  
 ouida, 95.  
 ovata, 136, 177, 178.  
 ovatus, 174.  
 ovina, 170.  
 ovis, 460.  
 ovulata, 148.  
 owenii, 182.  
 oxya, 45.  
 oxycephala, 207.  
 oxycephalum, 305.  
 oxygen compounds, 11.  
 oxyglossus, 289.  
 oxyodes, 68.  
 oxyperas, 134.  
 oxytenes, 44.  
 ozius, 31.

## p.

pabo, 256.  
 pachiarra, 63.  
 pachyarches, 55.  
 pachycercus, 321.  
 pachyotis, 443.  
 pachypus, 433.  
 pachysiphon, 165.  
 pachyura, 440.  
 pacificus, 357.  
 pactolus, 93.  
 pagodarum, 386.  
 pagodula, 150, 154.  
 pagurus, 25.  
 palæmon, 25.  
 palæornis, 408.  
 palaina, 166.  
 palimpsestis, 76.  
 palinurus, 25.  
 pallens, 87.  
 pallicostaria, 62.  
 pallida, 58, 76, 77, 82, 86,  
 104, 117, 167.  
 pallidicornis, 108.  
 pallidipes, 372.  
 pallidisca, 72.  
 pallidularia, 63.  
 pallidum, 178.  
 pallidus, 364.  
 pallium, 126.  
 pallivittata, 59.  
 palmarum, 92.  
 palmata, 87.  
 palpibrosus, 377.  
 palpopleura, 47.  
 paludomus, 155.  
 palumba, 68.  
 palumboides, 388.  
 palustris, 335, 368.  
 pama, 214.  
 pammon, 106.  
 pamphila, 92.  
 pan, 249.  
 panacra, 90.  
 panclax, 262.  
 panda, 104.  
 pandava, 92.  
 pandemis, 53.  
 pandesma, 70.  
 pandion, 101.  
 pandora, 137.  
 pandya, 84.  
 panesthia, 44.  
 pangasius, 255.  
 pangio, 273.  
 panolia, 456.  
 pannaceus, 151.  
 pannosaria, 61.  
 pansa, 173, 175.  
 pantala, 47.  
 pantherina, 153.  
 pantherinus, 248.  
 paphia, 80.  
 papilio, 105, 106.  
 papillionacea, 134.  
 papillionaria, 84.  
 papillionaris, 84.  
 papillosus, 398.  
 papyracea, 146, 148.  
 papyraceum, 132.  
 paradisea, 401.  
 paradiseus, 211, 379.  
 paradisi, 381.  
 paradoxornis, 364.  
 paradoxurus, 468.  
 paralina, 108.  
 parasia, 53.  
 parassa, 78.  
 parathelphusa, 30.  
 paravetta, 81.  
 pardale, 77.  
 pardalina, 148.  
 pardaria, 57.  
 pardicellata, 62.  
 pardicolor, 467.  
 pardus, 472.  
 pareas, 307.  
 pareba, 102.  
 paris, 106.  
 parisatis, 99.  
 parius, 151.  
 parivala, 81.  
 parra, 396.  
 parrhasius, 33.  
 parthenope, 29.  
 parthenos, 97.  
 partita, 84.  
 parus, 378.  
 parva, 86.  
 parvalis, 55.  
 parvata, 99.  
 parvula, 62, 100.  
 parvulus, 42.

- parvus, 165.  
 pasithoe, 102.  
 passalus, 89.  
 passer, 384.  
 passerita, 305.  
 paste eels, 22.  
 pastor, 386.  
 patella, 171.  
 patens, 163.  
 patna, 96.  
 patrana, 80, 84.  
 patroclus, 88.  
 patula, 68.  
 patulalis, 54.  
 patulata, 63.  
 paucipunctata, 77.  
 paucifera, 74.  
 paulina, 103, 104.  
 paupera, 141.  
 pauxillula, 173.  
 pavaca, 80.  
 pavo, 75, 389.  
 pavonica, 89.  
 pavoninus, 249.  
 payeni, 106.  
 pealii, 101.  
 pearsoni, 427.  
 pectinicornis, 84.  
 pectinirostris, 230.  
 pectoralis, 246, 361, 367.  
 pectunculoides, 128.  
 pectunculus, 129.  
 pedestris, 42.  
 pegasus, 225.  
 peguense, 339.  
 peniensis, 155, 163, 166,  
 172, 174, 175, 340, 419,  
 422.  
 pelagicus, 31.  
 pelamis, 322.  
 pelargopsis, 353.  
 pelecantus, 401.  
 pelliistrigina, 149.  
 pellona, 276.  
 pellorneum, 366.  
 pellucida, 134.  
 pelochelys, 340.  
 pelor, 209.  
 peltigera, 73.  
 peltogaster, 24.  
 pelvica, 380.  
 penanga, 85.  
 penangensis, 177.  
 penelope, 400.  
 pennatus, 407.  
 pentamera, 111.  
 pentastoma, 33.  
 pentastomidea, 35.  
 pentatoma, 43.  
 penthema, 98.  
 perarcta, 175.  
 percis, 222.  
 perenia, 57.  
 percompressa, 174.  
 percula, 240.  
 percussus, 362.  
 peregra, 177.  
 peregrinator, 403.  
 peregrinus, 108, 119, 381,  
 402.  
 perfectaria, 61.  
 pergesa, 90.  
 pericrotus, 381.  
 perigea, 74.  
 perilampus, 271.  
 perimuta, 94.  
 perina, 81.  
 periophthalmus, 228, 234.  
 peripia, 331.  
 permotaria, 58.  
 perna, 127.  
 pernis, 105.  
 pernobilis, 163.  
 peroneus, 176.  
 peronii, 169, 181.  
 peropaca, 67, 68.  
 perornata, 87.  
 perpaula, 173.  
 perplanata, 175.  
 perplexa, 112.  
 persa, 178.  
 perse, 93.  
 persens, 96.  
 persica, 143.  
 persimilis, 68, 98.  
 personata, 396.  
 personatus, 41, 226.  
 perspectivum, 151.  
 perspectivunculus, 151.  
 perspicualis, 55.  
 perspicuaria, 58.  
 perspicuata, 61.  
 pertenuis, 172.  
 perversa, 137.  
 petaria, 88.  
 petasus, 173.  
 petiolatus, 169.  
 petiti, 177.  
 petroleum, 14.  
 petrosa, 157.  
 petrosclites, 233.  
 Pfeifferi, 55.  
 Pfeifferi, 177.  
 phægorista, 88.  
 phænicophaus, 360.  
 phænicopterus, 387.  
 phænieura, 396.  
 phæocephalus, 368.  
 phæopus, 395.  
 phæton, 401.  
 phakellura, 55.  
 phalacra, 65.  
 phalangodes, 55.  
 phalanta, 98.  
 phalarina, 85.  
 phalaris, 89.  
 phalera, 81, 82.  
 phalga, 72.  
 phaneroptera, 45.  
 phasianella, 168.  
 phassus, 76.  
 phayrei, 164, 165, 175,  
 340, 363, 399, 388, 414.  
 pheidole, 117.  
 phelsuma, 330.  
 phenius, 100.  
 pherecinusalis, 64.  
 phibadosoma, 44.  
 phidippus, 97, 101.  
 philamata, 40.  
 philampelus, 90.  
 philecta, 73.  
 philentoma, 381.  
 philippensis, 401.  
 philippiana, 132, 177.  
 philippina, 104.  
 philippinarum, 132, 135,  
 147.  
 philippinus, 352.  
 philomela, 96.  
 philona, 88.  
 philopator, 84.  
 philoxena, 84.  
 philoxenus, 106.  
 phissima, 82.  
 phlaas, 93.  
 phodilus, 406.  
 pholas, 138.  
 phos, 143.  
 phryne, 103.  
 phryxe, 101.  
 pharys, 65.  
 phutunio, 268.  
 phyodes, 71.  
 phyllium, 44.  
 phylloenistis, 52.  
 phyllodes, 69.  
 phyllorhina, 428.  
 phyllornis, 370.  
 phyllosaria, 62.  
 phyllotreta, 108.  
 phylloxera, 37.  
 phymateus, 45.  
 phyophthiria, 37.  
 physematia, 56.  
 physomelus, 42.  
 physopelta, 42.  
 phytophaga, 108.  
 pica, 133, 145.  
 picaoides, 367.  
 picaria, 57.  
 picatus, 380.  
 piceus, 112.  
 picta, 88, 133, 436.  
 pictaria, 59.  
 pictus, 200, 305.  
 pictorus, 84.  
 pieridoides, 91.  
 pieris, 104.  
 pila, 169.  
 pileata, 353, 365.  
 pileatus, 179.

- pilidion, 175.  
 pimpla, 116.  
 pinisala, 63.  
 pinna, 128, 129.  
 pinnatus, 141.  
 pipastes, 375.  
 piscatorum, 23.  
 pisiformis, 21.  
 pisola, 91.  
 pistillum, 21.  
 pitasila, 85.  
 pithauria, 92.  
 pithecopis, 92.  
 placenta, 125.  
 placida, 393.  
 placunella, 133.  
 plagalis, 54.  
 plagiata, 60, 74, 82, 107.  
 plagiatus, 41.  
 plagidotata, 63.  
 plagifera, 57, 77.  
 plaginota, 86.  
 plagiosa, 99.  
 plana, 69, 83, 84, 86.  
 planaria, 58.  
 planata, 38, 134.  
 planatus, 129.  
 planaxis, 156.  
 planicostata, 144.  
 planissima, 135.  
 planiventris, 42.  
 planorbis, 178.  
 planus, 113, 149.  
 platax, 218.  
 platinum, 9.  
 platophrys, 248.  
 platurus, 316, 322.  
 platycephalus, 224.  
 platyglossus, 245.  
 platyleucata, 58.  
 platylophus, 387.  
 platynotus, 336.  
 platypleura, 40.  
 platyrhyncha, 395.  
 platysmurus, 387.  
 platysternon, 339.  
 plebeius, 199, 212.  
 plecotrema, 178.  
 plecotus, 431.  
 plectopylis, 174, 175.  
 plectostoma, 175.  
 plectotropis, 175.  
 plesioneura, 91.  
 plesiops, 204.  
 pleurona, 65.  
 pleuronectes, 127.  
 pleurotoma, 142.  
 plexippus, 101.  
 plicalis, 64.  
 plicata, 134, 147, 169, 176,  
     178.  
 plicatula, 126.  
 plicatus, 351.  
 plicifer, 172.  
 plinius, 92.  
 plocens, 383.  
 plotosus, 257.  
 plotus, 402.  
 plumatus, 375.  
 plumbea, 303.  
 plumbeitarsus, 373.  
 plumbeo-micans, 93.  
 plumbipes, 391.  
 plumipes, 405.  
 plumosa, 17, 82.  
 plumosus, 369.  
 plurilinearia, 59.  
 pluristriaria, 59.  
 pluristrigata, 59.  
 plusiata, 81.  
 plusiodonta, 71.  
 pluto, 92.  
 plutusalis, 55.  
 plynusaria, 59.  
 phoepeya, 362.  
 poaphila, 66.  
 podaliriata, 63.  
 podica, 396.  
 podiceps, 400.  
 podophthalma, 24, 169.  
 podops, 43.  
 pœcilocampa, 77.  
 pœcilorhyncha, 399.  
 poliaëtus, 404.  
 poliocephalus, 396.  
 poliohierax, 403.  
 poliopsis, 404.  
 polistes, 118.  
 polita, 169.  
 politus, 166, 167.  
 polota, 198.  
 polybia, 118.  
 polydesma, 70.  
 polydonta, 169.  
 polygona, 135.  
 polygonoma, 167.  
 polymena, 82, 85.  
 polymesata, 63.  
 polymnestor, 106.  
 polyommatus, 92.  
 polynemus, 211.  
 polypedates, 294.  
 polyphasia, 359.  
 polyplectron, 390.  
 polypleuris, 166, 173.  
 polyrhachis, 117.  
 polyspila, 67.  
 polytela, 75.  
 polytes, 106.  
 polyzonus, 109.  
 pomacentrus, 241.  
 pomarinus, 400.  
 pomatias, 163.  
 pomatorhinus, 366.  
 pomonalis, 55.  
 pompeius, 106.  
 pompeus, 105.  
 pompilius, 179.  
 pompilus, 119.  
 pomponia, 40.  
 ponderosa, 146.  
 ponera, 117.  
 pontia, 103.  
 ponteceria, 380.  
 poongi, 173.  
 popilia, 112.  
 porcinus, 456.  
 poritia, 94.  
 porocephalus, 230.  
 porosus, 335.  
 porphyraeus, 313.  
 porphyricolus, 43.  
 porphyrio, 396.  
 porphyriticus, 164, 169.  
 porphyromelas, 348.  
 porsica, 53.  
 porus, 44.  
 porzana, 396.  
 postica, 81.  
 postincisa, 83.  
 potamophora, 69.  
 potera, 57.  
 praba, 91.  
 prabha, 94.  
 prabhasa, 87.  
 præcedens, 70.  
 præcipua, 66.  
 præmordica, 155.  
 præstans, 174.  
 pralaya, 90.  
 prasana, 81.  
 prasena, 86.  
 prasina, 76, 384.  
 prasinocelis, 398.  
 prasinus, 205.  
 pratincola, 371.  
 pratipa, 101.  
 precis, 97.  
 pretiosus, 151.  
 prevostii, 416.  
 prinia, 373.  
 prionaca, 43.  
 prioneris, 102.  
 prionochilus, 362.  
 prionodon, 467.  
 prioptera, 108.  
 pristis, 135, 286.  
 pristolepis, 205.  
 privatana, 53.  
 processaria, 61.  
 procheilus, 463.  
 procodeca, 83.  
 procopialis, 55.  
 procris, 99.  
 procumbens, 175.  
 procursaria, 61.  
 prodentia, 75.  
 prominens, 76, 87.  
 propachys, 64.  
 proregulus, 373.  
 proscripta, 75.  
 prosopceas, 171, 172.

- prospalta, 74.  
 protenor, 106.  
 protheclaria, 58.  
 prothedes, 72.  
 prothoe, 97.  
 protuberans, 87.  
 provocans, 71.  
 pruinosa, 76.  
 pruinosis, 421.  
 psalis, 83.  
 psammobia, 135.  
 psammocoda, 135.  
 psammodynastes, 301.  
 psammophilis, 304.  
 psarisomus, 354.  
 psaroides, 368.  
 psettus, 218.  
 pseudentropius, 255.  
 pseudo-centaurus, 100.  
 pseudochromis, 223.  
 pseudodax, 247.  
 pseudo-deltoides, 65.  
 pseudolonginus, 93.  
 pseudophis, 175.  
 pseudopus, 327.  
 pseudorhombus, 248.  
 pseudo-roxus, 92.  
 pseudoscarus, 247.  
 psilomelane, 13.  
 psittacalis, 55.  
 psittinus, 409.  
 psyra, 57.  
 pteroceras, 152.  
 pterocosmus, 50.  
 pterocyclos, 165.  
 pterois, 207.  
 pteromys, 416.  
 pteropoda, 139.  
 pteropus, 423.  
 pterothysanus, 85.  
 pteruthius, 375.  
 ptilomera, 41.  
 ptilorhynchus, 405.  
 ptyas, 301.  
 ptychozoon, 330.  
 ptyelus, 38.  
 ptyonoprogne, 357.  
 pubescintella, 53.  
 puella, 148, 371.  
 puera, 71.  
 pugilina, 142.  
 pugio, 130.  
 pygmax, 391, 395.  
 pulaha, 95.  
 pulchella, 84, 85, 87, 157.  
 pulchellus, 353.  
 pulcherrima, 73, 75, 81, 170.  
 pulchra, 43, 293.  
 pulchralis, 56.  
 pulchripecta, 72.  
 pulchrum, 407.  
 pulcarius, 151.  
 pullatus, 165.  
 pulligera, 168.  
 pullula, 67.  
 pullus, 113.  
 pulmonata, 171.  
 pulomaya, 91.  
 pulverulentus, 301, 317.  
 pumila, 118.  
 punctaria, 108.  
 punctata, 78, 82, 87, 144, 203, 222.  
 punctatus, 151, 169, 238, 242.  
 punctellus, 61.  
 puncticulata, 157.  
 puncticulus, 151.  
 punctifascia, 88.  
 punctifera, 34.  
 punctiferalis, 54.  
 punctilineata, 76.  
 punctipennis, 45.  
 punctosa, 69.  
 punctulata, 384.  
 punctulatus, 301.  
 punica, 78.  
 punicea, 87.  
 puniceus, 348, 388.  
 puntang, 225.  
 puntio, 268.  
 pupa, 176.  
 pupaeformis, 154, 166.  
 pupina, 166.  
 papipara, 48.  
 pupivora, 115.  
 puppensis, 166.  
 purpura, 115.  
 purpurascens, 56.  
 purpurea, 246, 375, 397.  
 purpuricenus, 109.  
 purreea, 92.  
 pusilla, 89, 143, 178, 262, 385.  
 pusillus, 151, 167, 172, 369, 437.  
 puspa, 92.  
 pustularia, 153.  
 putra, 91.  
 putus, 172.  
 pycnonotus, 369.  
 pycoris, 364.  
 pygargus, 405.  
 pygerythrus, 414.  
 pygmaea, 396.  
 pygmaeus, 395, 402.  
 pygospila, 55.  
 pylaica, 173.  
 pyralina, 66.  
 pyralis, 56.  
 pyrameis, 97.  
 pyramidalis, 167.  
 pyramidella, 150.  
 pyramis, 172.  
 pyranthe, 101.  
 pyrene, 104.  
 pyretorum, 79.  
 pyrgomorpha, 45.  
 pyrgus, 92.  
 pyrite, 10.  
 pyrope, 39.  
 pyroxene, 13.  
 pyrrhochroma, 83.  
 pyrrhogenys, 445.  
 pyrrhopterum, 381.  
 pyrrhotes, 348.  
 pyrula, 112.  
 pyrusta, 56.  
 pythia, 178.  
 python, 307.  
 pyxidatus, 127.  
 pyxidea, 337.  
 pyxis, 168.
- q.**
- quadrella, 31.  
 quadricornis, 233.  
 quadrifasciata, 52, 108.  
 quadrilinealis, 61.  
 quadrilineata, 72.  
 quadrilineatus, 295.  
 quadriplaga, 87.  
 quadripunctata, 63.  
 quadrisignata, 87.  
 quartz, 13.  
 quenavadi, 70.  
 quercetorum, 93.  
 querquedula, 100.  
 quinaria, 69, 62.  
 quincunciatus, 302.  
 quinquelinearis, 65, 193.  
 quinquelineatus, 192, 196.  
 quinqueplicata, 118.  
 quinque-striatus, 227, 416.
- r.**
- rachia, 82.  
 radians, 87.  
 radiata, 133, 136, 171.  
 radiatum, 169, 301, 407.  
 radiatus, 135, 169.  
 radza, 96.  
 rafflesii, 349, 413.  
 rajendra, 82.  
 rallina, 397.  
 rallus, 397.  
 rama, 91.  
 ramadasa, 75.  
 ramdeo, 101.  
 ramila, 61.  
 ramosa, 57.  
 ramosum, 17.  
 ramriensis, 173.  
 ramsayi, 349, 367.  
 rana, 84, 389.  
 ranatra, 41.

- ranella, 143.  
 ranga, 99, 194.  
 ranghana, 87.  
 rapa, 142, 146, 147.  
 raphidea, 25.  
 rasbora, 268.  
 ratarda, 85.  
 rattus, 151.  
 ravana, 106.  
 ravata, 94.  
 ravi, 90.  
 rawesiana, 168.  
 raya, 81.  
 raytal, 385.  
 recta, 40.  
 rectata, 63.  
 rectestria, 71.  
 rectificata, 57.  
 rectilinea, 68.  
 rectivitta, 73, 93.  
 rectivittalis, 65.  
 recurvalis, 56.  
 recurvirostris, 392.  
 redoa, 83.  
 reduplicalis, 65.  
 reduvius, 40, 41.  
 reeveana, 142.  
 reevei, 155.  
 refuga, 175.  
 regalis, 84.  
 registoma, 166.  
 regulata, 59, 155.  
 reguloides, 373.  
 reinhardtii, 174.  
 religiosa, 81.  
 remba, 103.  
 remies, 135.  
 remifer, 378.  
 remigia, 66.  
 remotata, 59.  
 renalis, 74.  
 repanda, 77.  
 reparata, 61.  
 replenens, 68.  
 reponens, 39.  
 resplendens, 52, 173, 174.  
 restitutaria, 62.  
 restorans, 68.  
 reticosa, 144.  
 reticulalis, 55.  
 reticularis, 168, 279, 283.  
 reticulata, 56, 66, 87, 117.  
 reticulatus, 307.  
 retina, 84.  
 retorta, 68.  
 retractaria, 61.  
 retractata, 78.  
 retrahens, 68.  
 retrorsa, 174.  
 retusa, 132.  
 retusum, 143.  
 rhadamanthus, 102, 105.  
 raphaulus, 165.  
 raphia, 108.  
 raphidopalpa, 108.  
 raphigaster, 43.  
 rhesus, 478.  
 rhetenor, 106.  
 rhinobatus, 286.  
 rhinoceros, 451.  
 rhinocypha, 47.  
 rhinolophus, 426.  
 rhinoplax, 351.  
 rhinopoma, 438.  
 rhinortha, 360.  
 rhlostoma, 165.  
 rhpidophorus, 110.  
 rhizoconus, 151.  
 rhizonmys, 421.  
 rhodaria, 56.  
 rhodifer, 106.  
 rhodoneura, 55.  
 rhodophila, 82.  
 rhodoptera, 89.  
 rhombea, 128.  
 rhombodera, 44.  
 rhomboides, 135.  
 rhomborrhina, 112.  
 rhopalorhynchus, 32.  
 rhynchaëa, 394.  
 rhynchium, 118.  
 rhynchobdella, 235.  
 rhynchophora, 109.  
 rhynchops, 304, 401.  
 rhythemis, 47.  
 rhypparia, 57.  
 rhysota, 174.  
 ricania, 39.  
 richardi, 375.  
 richthofeni, 166, 167.  
 ricinella, 53.  
 ricini, 53, 80.  
 ricinula, 145.  
 ridibunda, 400.  
 rigosa, 17.  
 rigusaria, 63.  
 rimella, 152.  
 rinaca, 79.  
 ringicula, 118.  
 riopa, 329.  
 riparia, 356.  
 riptortus, 42.  
 risa, 97.  
 risella, 155.  
 risoba, 76.  
 risorius, 389.  
 rissiona, 156.  
 rita, 252.  
 rivula, 64.  
 rivulatus, 247.  
 roberti, 362.  
 robusta, 318.  
 robustulus, 418.  
 roepstorffi, 85, 104, 164,  
 172, 173.  
 roepstorffiana, 163.  
 roepstorffianum, 165.  
 rohita, 263.  
 rohria, 95.  
 rohitee, 269.  
 rollulus, 390.  
 romalana, 86.  
 romulus, 106.  
 rosalia, 59, 109.  
 rosea, 77, 135.  
 roseata, 87.  
 roseatum, 143.  
 roseus, 381, 386.  
 rosimon, 92.  
 rostellaria, 152.  
 rostrata, 69.  
 rotatoria, 175.  
 rotella, 169.  
 rotifera, 23.  
 rotula, 173.  
 rotundicaudatus, 24.  
 roudroul, 390.  
 roxus, 92.  
 roylei, 80, 109.  
 rubeculoides, 382.  
 rubella, 156.  
 ruber, 154.  
 rubicilia, 73.  
 rubida, 168, 459.  
 rubidipinnis, 273.  
 rubidorsa, 82.  
 rubidus, 332.  
 rubiginosa, 118, 365.  
 rubiginosus, 42.  
 rubigula, 369.  
 rubilinea, 82.  
 rubitincta, 82.  
 rubricans, 66.  
 rubricapillus, 365.  
 rubricauda, 401.  
 rubriceps, 64.  
 rubricosa, 419.  
 rubrifrons, 86.  
 rubrivitta, 84.  
 rubronigra, 383.  
 rubro-picta, 42.  
 rubro-punctatum, 43.  
 rubropygia, 354.  
 rudha, 99.  
 rudis, 353.  
 rudolphi, 145.  
 rudra, 98.  
 rufa, 347, 386.  
 rufescens, 65.  
 rufibasis, 66.  
 ruficapillus, 374.  
 ruficeps, 364, 373, 388.  
 ruficollis, 395.  
 rufifrons, 365.  
 rufigenis, 413.  
 rufina, 400.  
 rufinotus, 348.  
 rufipennis, 388.  
 rufitinctus, 404.  
 rufiventris, 111.  
 rufivinctata, 63.  
 rufogularis, 391.

rufomarginata, 61.  
 rufovarius, 39.  
 rufula, 373, 375.  
 rufulus, 364.  
 rufus, 298.  
 rugifera, 328.  
 rugosa, 27, 142.  
 rugosella, 53.  
 rugosum, 131.  
 rugulosus, 31.  
 runconicus, 219.  
 runeka, 96.  
 rüppellii, 279.  
 rusa, 456.  
 russeli, 312.  
 russus, 42.  
 rustica, 356.  
 rusticola, 394.  
 rusticus, 142.  
 rutherfordi, 404, 405.  
 ruticilla, 372.  
 rutila, 385, 399.  
 rutilans, 465.

## S.

sabina, 47.  
 saccharina, 171.  
 saccobranchus, 258.  
 saccolaimus, 437.  
 sacellum, 145.  
 sacerdotum, 252.  
 sacra, 398.  
 sacaria, 57.  
 sadana, 80.  
 sadanundio, 227.  
 sagara, 92.  
 sagax, 112.  
 sagittatus, 407.  
 sagra, 108.  
 sahadeva, 100.  
 sakra, 96.  
 salamina, 69.  
 salaris, 233.  
 salassa, 79.  
 salebrosa, 69.  
 salmoides, 190.  
 salpinx, 102.  
 salsala, 104.  
 saltatoria, 45.  
 salvator, 327.  
 salwiniana, 131, 176.  
 samada, 100.  
 samatha, 100.  
 samba, 96.  
 sambara, 90.  
 samea, 56.  
 samoensis, 127.  
 sanaca, 103.  
 sanatana, 96.  
 sancara, 100.  
 sanctæ-crucis, 108.  
 sangana, 82.  
 sangiensis, 195.  
 sangra, 92.  
 sanguithua, 81.  
 sanguilineata, 60.  
 sanguinalis, 82.  
 sanguinaria, 59.  
 sanguinea, 40, 77.  
 sanguineus, 31.  
 sanguinipectus, 361.  
 sanguinolentus, 31.  
 sanguinosus, 41.  
 sanis, 174.  
 sankeyi, 166, 177.  
 saponaria, 59.  
 saraglossa, 386.  
 sarana, 266.  
 sarbanissa, 73.  
 sarcophorus, 393.  
 sarcoptes, 33.  
 sardinella, 271.  
 sarkidiormis, 399.  
 saronaga, 76.  
 saronis, 94.  
 sarpedon, 106.  
 sasia, 346.  
 sassivarna, 91.  
 sasunaga, 75.  
 satanas, 89.  
 satarupa, 90.  
 satastes, 89.  
 satricus, 95.  
 satropaces, 100.  
 saturata, 81.  
 saturnia, 79, 174.  
 saturnioides, 68.  
 satyrus, 95.  
 saularis, 371.  
 sauris, 57.  
 sauropatis, 353.  
 saussurii, 44.  
 saxatilis, 361.  
 scabiei, 32.  
 scabra, 155.  
 scabrator, 42.  
 scabrina, 164.  
 scabrinus, 35.  
 scabris, 158.  
 scabriuscula, 44, 134.  
 scalaria, 149.  
 scalarina, 153.  
 scalaroidea, 166.  
 scalpatram, 118.  
 scalpturita, 175.  
 scanda, 95.  
 scandens, 239.  
 scaphula, 129.  
 scaptosyle, 85.  
 scapularis, 246.  
 scatophagus, 202.  
 scenoma, 175.  
 schenerrhi, 85.  
 schenicki, 373.  
 schenobius, 64.  
 scherzeri, 425.  
 schistacea, 63.  
 schistaccaria, 63.  
 schistaceus, 374.  
 schisticeps, 396, 409.  
 schistosa, 322.  
 schistosum, 302.  
 schizodaetylus, 45.  
 schizonycha, 112.  
 schlosseri, 229.  
 schneiderianum, 331.  
 schomburghii, 176.  
 schrakra, 95.  
 schreibersii, 436, 437.  
 schultzei, 279.  
 seicna, 212.  
 seicnoides, 214.  
 scieroptera, 40.  
 scimisalis, 54.  
 scintillans, 85, 230.  
 sciopila, 377.  
 scirpophaga, 64.  
 scissimargo, 164.  
 sciticaudaria, 63.  
 scitula, 145.  
 scirurus, 411.  
 sclateri, 106.  
 scolapacina, 394.  
 scolia, 118.  
 scolopax, 392, 394.  
 scolopendra, 32.  
 scolopsis, 197.  
 scomber, 220.  
 scopigeralis, 64.  
 scoplodes, 78.  
 scopis, 407.  
 scopula, 54.  
 scorpana, 207.  
 scorpaenopsis, 207.  
 scorpio, 25, 152.  
 scorpionoides, 26.  
 scortum, 135.  
 scotophilus, 434.  
 scotosia, 57.  
 scotozous, 432.  
 scripta, 133.  
 scriptaria, 61.  
 scriptilis, 70.  
 scriptus, 300.  
 scrobicularia, 136.  
 scrobiculatus, 172.  
 scrupulum, 167.  
 sculptilis, 167.  
 sculptus, 151.  
 scurra, 153, 164.  
 scutellata, 38, 147.  
 scutellera, 43.  
 scuticosum, 143.  
 scutum, 130.  
 scutus, 170.  
 seylax, 96.  
 scylla, 31.  
 sebe, 240.  
 sebastichthys, 207.  
 sectilabre, 165.

- securis, 83.  
 seena, 401.  
 sejuncta, 75.  
 sejunctalis, 65.  
 selenampha, 74.  
 selene, 79.  
 selenia, 63.  
 selenis, 66.  
 selenophora, 99.  
 selhetensis, 89.  
 seluputo, 406.  
 semamora, 91.  
 semicincta, 83.  
 semicirculata, 57.  
 semiclarata, 61.  
 semicoccinea, 52.  
 semicompleta, 59.  
 semicornu, 175.  
 semidecussata, 134.  
 semidoliatus, 227.  
 semifasciata, 147.  
 semigassis, 149.  
 semiherbida, 73.  
 semihyalina, 58.  
 semiluctuosus, 109.  
 semilugens, 72.  
 semiplotus, 265.  
 semiscita, 49.  
 semiserica, 176.  
 semistriata, 170.  
 semisulphurea, 52.  
 semivitta, 71.  
 semnopithecus, 478.  
 sena, 90.  
 sendyra, 88.  
 senex, 401.  
 seperans, 67.  
 sephen, 287.  
 sepiä, 181.  
 septempunctata, 38, 107.  
 septemspinosa, 29.  
 septemtrionis, 102.  
 serica, 112.  
 sericea, 83, 372.  
 sericearia, 63.  
 sericeipennis, 86.  
 serilophus, 354.  
 serinetha, 42.  
 serranus, 189.  
 serrata, 21, 31, 237.  
 serratus, 225.  
 serrodes, 67.  
 sertularia, 17.  
 sertum, 145.  
 serva, 86.  
 sesapa, 88.  
 sesara, 173.  
 sesarma, 29.  
 sesia, 89, 104.  
 seta, 102.  
 setina, 87.  
 setinochroa, 87.  
 setosa, 17.  
 severus, 403.  
 sexareata, 107.  
 sexlineatus, 327.  
 sexmaculata, 47, 108.  
 sex-notatus, 76.  
 sex-punctalis, 55.  
 sex-punctata, 85.  
 shahma, 85.  
 shanensis, 157, 175.  
 sherwillii, 81.  
 shistacea, 93.  
 shiva, 45.  
 shivula, 65.  
 shorii, 347.  
 siamensis, 102, 299, 377, 385.  
 sibia, 367.  
 sibiricus, 364, 382.  
 siccifolia, 71.  
 sicydium, 228.  
 siderea, 70.  
 sidonis, 95.  
 sidyma, 86.  
 sieboldii, 303.  
 signata, 56, 71, 107.  
 signifera, 72.  
 sihama, 223.  
 sikkima, 74, 80, 81.  
 sikkimensis, 74, 76, 81, 113.  
 silhetana, 103.  
 silhetalis, 56.  
 silhetensis, 94.  
 sillago, 222.  
 silundia, 258.  
 silurus, 256.  
 simia, 149.  
 simaræa, 86.  
 similaria, 57, 59.  
 similaris, 175.  
 similis, 72, 78, 83, 101, 134.  
 simla, 80.  
 simotes, 299.  
 simplex, 361.  
 simplicata, 58.  
 simplicella, 53.  
 simulans, 109.  
 simulata, 75.  
 simulatrix, 102.  
 simulum, 49.  
 simyra, 76.  
 sinens, 73.  
 sinensis, 30, 81, 176, 220, 230, 356, 364, 386, 398.  
 singalensis, 361.  
 singara, 65.  
 singha, 65.  
 singularis, 142.  
 sinha, 98.  
 sinorix, 95.  
 sinuata, 60, 74, 82, 87.  
 sinuosa, 72.  
 sipalus, 109.  
 siphia, 383.  
 siphonaria, 179.  
 siphonata, 131.  
 sipylus, 45.  
 sistroidea, 141.  
 sistrum, 145.  
 sisunaga, 60.  
 sisyrphora, 55.  
 sitala, 173.  
 sitiene, 89.  
 sitta, 362.  
 siva, 92, 100, 377.  
 swainsoni, 150.  
 sladeni, 85, 271, 276, 415, 419.  
 smaragdina, 117.  
 smaragdinus, 128.  
 smaragdipennis, 108.  
 smaragdulus, 147.  
 sminthus, 42.  
 smithii, 168.  
 smyrnensis, 353.  
 sol, 125.  
 solarioides, 158.  
 solaris, 381.  
 solarium, 151.  
 solea, 248.  
 solecurtus, 136.  
 solen, 136.  
 solenosthedium, 43.  
 solidulus, 140, 177.  
 solita, 70.  
 solium, 20.  
 soloensis, 404.  
 soma, 98.  
 somatina, 59.  
 somera, 83.  
 sondaicus, 451, 460.  
 sonneratii, 359.  
 sophina, 172.  
 sophronia, 47.  
 sordida, 82, 83, 99, 377.  
 sordidus, 242, 347.  
 spadiceus, 417.  
 spargens, 73.  
 sparsaria, 53.  
 sparsum, 138.  
 sparveroides, 359.  
 spasma, 430.  
 spathulata, 134.  
 speciosa, 387.  
 speciosus, 164.  
 spectabilis, 89.  
 specularia, 58, 62.  
 specularis, 63.  
 speiplena, 53.  
 speiredonia, 68.  
 spelæa, 426.  
 speoris, 429.  
 sperata, 166.  
 sphæriphora, 65.  
 sphærium, 132.  
 sphærolaria, 22.  
 sphenocercus, 388.  
 sphenorrhina, 39.  
 sphenurus, 388.



- spheria, 137.  
 sphetta, 82.  
 sphingiformis, 82.  
 sphingomorpha, 66.  
 sphinx, 90.  
 spilogaster, 405.  
 spilonotus, 377.  
 spilopectera, 386.  
 spilornis, 405.  
 spilosama, 82.  
 spilota, 74.  
 spinolæ, 39.  
 spinosa, 27, 337.  
 spinosus, 270.  
 spiralis, 22, 318.  
 spiraculum, 165.  
 spirama, 68.  
 spirifer, 280.  
 spiroglythus, 15 v.  
 spirula, 181.  
 spissa, 66.  
 spizactus, 405.  
 splendens, 112, 387.  
 splendidula, 49.  
 spodiopygia, 358.  
 spodoptera, 75.  
 spondylus, 126.  
 spongiophila, 24.  
 spumarius, 38.  
 spurcataria, 62.  
 squamata, 362.  
 squamiceps, 372.  
 squamifera, 31.  
 squammulata, 169.  
 squamosa, 131, 344.  
 squarrosa, 169.  
 squatarola, 393.  
 squilla, 25.  
 squillarum, 24.  
 stachyris, 365.  
 stagnatilis, 395.  
 stalactite, 14.  
 stalagmite, 14.  
 staphylæa, 153.  
 staphylocystis, 21.  
 stauropus, 81.  
 stegostoma, 285.  
 stella, 124.  
 stellata, 224.  
 stellatus, 109, 340.  
 stenopsyche, 48.  
 stenothyra, 157.  
 stentor, 330.  
 steutorea, 372.  
 stephanoconus, 151.  
 stercorarius, 400.  
 sterna, 401.  
 sternoxi, 111.  
 sterrha, 57.  
 stephus, 173.  
 stethojulis, 214.  
 stevensonii, 267.  
 stewartii, 26.  
 sthenocephalus, 255.  
 stigma, 268.  
 stigmata, 144.  
 stigmata, 67, 82, 95.  
 stigmatalis, 61.  
 stigmataria, 147.  
 stigmatius, 111.  
 stigmoleuca, 67.  
 stilpnus, 44.  
 stipitana, 43.  
 stola, 67.  
 stolalis, 54.  
 stolata, 113.  
 stolatus, 302.  
 stoliczkae, 263.  
 stoliczkana, 170.  
 stoliczkanus, 268.  
 stolidi, 67.  
 stolidus, 401.  
 stollii, 43.  
 stoparola, 382.  
 strabo, 93.  
 stracheyi, 266.  
 strachia, 43.  
 straminea, 150.  
 strangei, 143.  
 streniataria, 58.  
 strenuataria, 58.  
 strenura, 394.  
 strepera, 399.  
 strepitans, 367.  
 strepsilas, 394.  
 streptaxis, 177.  
 striata, 384, 389, 397.  
 striataria, 58.  
 striatovirens, 73.  
 striatula, 128, 135.  
 striatus, 238, 244, 368,  
 377, 397.  
 stricticollis, 320.  
 strictopæa, 102.  
 strictoptera, 70.  
 strigata, 67.  
 strigatus, 31.  
 strigidisca, 75.  
 strigiventer, 245.  
 strigosus, 29, 215.  
 strigula, 377.  
 striolata, 356, 375.  
 striolatus, 234.  
 strix, 406.  
 strixaria, 61.  
 stromateus, 220.  
 strombus, 152.  
 strongia, 207.  
 strongylurus, 260.  
 strongylus, 22.  
 strophiota, 383.  
 stultalis, 54.  
 stuposa, 67.  
 sturnia, 386.  
 sturnina, 386.  
 sturnopastor, 385.  
 styx, 90.  
 suana, 77.  
 suava, 103.  
 subarnea, 43.  
 subapicalis, 74.  
 subapicaria, 56.  
 subarquata, 345.  
 subbasalis, 61.  
 subcineta, 318.  
 subcordata, 85.  
 suberistata, 334.  
 subdita, 102.  
 subfascia, 83.  
 subfasciata, 88.  
 subfasciatus, 104.  
 subfurcatus, 357.  
 subfusiformis, 172.  
 subganomella, 53.  
 sublavaria, 61.  
 sublevigatus, 164.  
 submarginata, 69.  
 subminiatus, 302.  
 submira, 67.  
 subnigra, 83.  
 subobliquaria, 59.  
 subochracea, 92.  
 subochraceum, 366.  
 subradiatus, 92.  
 subrata, 99.  
 subruficollis, 351.  
 subsatura, 69.  
 subsignata, 372.  
 subsimilis, 86.  
 substigmata, 63.  
 substituta, 56.  
 substrigilis, 89.  
 substruens, 69.  
 subtessalalis, 54.  
 subtestaceus, 91.  
 subtilis, 73.  
 subulatum, 152.  
 subvittatus, 92.  
 subviridis, 377.  
 succinator, 109.  
 succinea, 176.  
 succineus, 167.  
 suecica, 372.  
 suffusa, 73, 74, 82, 93.  
 suffusalis, 56.  
 sugriva, 94.  
 suillus, 413.  
 sula, 401.  
 sulcata, 156.  
 sulcatus, 127.  
 sulcipenne, 109.  
 sultanea, 378.  
 sumatrana, 397, 401.  
 sumatranus, 253, 354, 360.  
 sumatrensis, 118, 405, 453.  
 sumitra, 94.  
 summana, 190.  
 sundara, 382.  
 sunetta, 133.  
 superalis, 55.  
 superans, 83.  
 superba, 53, 89.

superciliaris, 373.  
 superciliosus, 373.  
 superbus, 126.  
 superna, 92.  
 sura, 91, 95.  
 suradeva, 88, 96.  
 suratensis, 389.  
 surniculus, 359.  
 surya, 97.  
 suthora, 364.  
 sutorius, 372.  
 sus, 454.  
 susruta, 99.  
 suya, 373.  
 syama, 94.  
 sybrida, 82.  
 sykesii, 380.  
 syla, 93.  
 sylheticus, 176.  
 symbrenthia, 97, 99.  
 syme, 53.  
 symethus, 95.  
 symphædra, 100.  
 sympis, 66.  
 synagris, 197.  
 synaptura, 249.  
 synchloe, 104.  
 synclera, 55.  
 syngamus, 22.  
 syngnatus, 280.  
 synotus, 431.  
 syntomis, 85.  
 synpa, 68.  
 syringa, 87.  
 synium, 406.  
 systropha, 86.  
 swaha, 95.  
 swainsonii, 405.

# t.

tabanula, 147.  
 tabescens, 152.  
 tachina, 49.  
 tachydromus, 327.  
 tæitus, 48.  
 tænia, 20, 21, 144.  
 tænianotus, 209.  
 tæniata, 149.  
 tæniocerus, 113.  
 tæniopterus, 52.  
 tagiades, 90.  
 tagora, 84.  
 talapa, 65.  
 talienwahensis, 125.  
 tallia, 101.  
 talpa, 439.  
 talpæ, 21.  
 talusalis, 65.  
 tantalus, 398.  
 taoana, 99, 100.  
 tapes, 134.  
 taphonyeteris, 437.

taphozous, 437.  
 taprobana, 53.  
 taprobanes, 47.  
 taragama, 77.  
 tardigradus, 474.  
 tarika, 86.  
 tarpina, 94.  
 tarsi, 107.  
 tavia, 69.  
 tavoyensis, 130.  
 taxila, 95.  
 taxoides, 464.  
 tectirostris, 378.  
 tectura, 170.  
 teesa, 405.  
 tegulata, 87.  
 temopalpus, 107.  
 telabon, 278.  
 telara, 274.  
 telasco, 144.  
 telchinia, 102.  
 telearchus, 106.  
 telescopium, 154.  
 tellinella, 135.  
 tellinides, 135.  
 temmincki, 109.  
 temminckii, 285, 362, 395,  
 434.  
 temnaspis, 108.  
 templeana, 156.  
 tenebralis, 65.  
 tenebraria, 57.  
 tenebrica, 128.  
 tenebrosa, 42, 45, 70, 75,  
 82, 83, 89.  
 tenebrosaria, 61.  
 tenella, 39.  
 tenellipes, 373.  
 tenera, 140.  
 tenerum, 178.  
 tentacularis, 226.  
 tentredo, 115.  
 tenuicollis, 21.  
 tenuirostris, 359, 371.  
 tenuis, 72.  
 tenuiscapa, 122.  
 tenuisculpta, 148.  
 tenuisigna, 87.  
 tenuispira, 172.  
 tephrocephalus, 373.  
 tephrodornis, 380.  
 tephronotus, 380.  
 tephrosaria, 59.  
 tephrosia, 61.  
 terastia, 56.  
 terat, 380.  
 terebellum, 150, 152.  
 terebra, 150.  
 terebrantia, 115.  
 teredo, 139.  
 terekia, 395.  
 terias, 103, 104.  
 termes, 47.  
 terminalis, 52.

terminalis, 86.  
 terminata, 87, 121.  
 terminigera, 66.  
 ternatana, 142.  
 ternispira, 141.  
 terpsichore, 40.  
 tessalata, 67, 77.  
 tessalatus, 43.  
 testacea, 76.  
 testacearia, 63.  
 testaceata, 63.  
 testudinaria, 171.  
 testudo, 336.  
 tetradactylus, 212.  
 tetradrachmum, 240.  
 tetragonosoma, 307.  
 tetrahedrite, 11.  
 tetraonalis, 55.  
 tetraonyx, 339.  
 tetraspila, 70.  
 tetrodon, 283.  
 tettigonia, 38.  
 teulisma, 87.  
 teuta, 100.  
 teuthis, 209.  
 teutoides, 100.  
 textile, 151.  
 textilina, 146.  
 textilis, 83.  
 textor, 81.  
 tetrina, 173.  
 textum, 143.  
 thaduca, 100.  
 thalamita, 31.  
 thalassina, 26.  
 thalassinus, 253.  
 thalassodes, 60.  
 thalassophila, 178.  
 thalatta, 70.  
 thalera, 60.  
 thalessa, 145.  
 thaliarchus, 106.  
 thalpochares, 72.  
 thalpopphila, 74.  
 thanaos, 92.  
 thaumalea, 390.  
 thaumantias, 101.  
 thaumantis, 101.  
 theclodes, 94.  
 theliostyla, 169.  
 thelphusa, 30.  
 thelyphonus, 35.  
 theobaldi, 142, 158, 172,  
 177, 299, 437.  
 theobaldiana, 156.  
 theobaldianus, 163.  
 theophila, 81.  
 theophrastus, 92.  
 therapon, 196.  
 thermesia, 66.  
 thestylis, 102.  
 thetys, 95.  
 thiacidias, 81.  
 thiara, 133.

- thiarella, 145, 155.  
 thimaria, 17.  
 thisbe, 103.  
 thisizima, 53.  
 thoasalis, 54.  
 thoracia, 40.  
 thoracica, 24.  
 thoracites, 139.  
 thouini, 286.  
 thrax, 91.  
 threnodes, 359.  
 thriponax, 347.  
 thrips, 43.  
 thukujar, 29.  
 thyatira, 76.  
 thyelia, 89, 100.  
 thymara, 85.  
 thyodamas, 97.  
 thyridospila, 65.  
 thyrsis, 91.  
 thyrsoides, 279.  
 tiaris, 334.  
 tiarodes, 42.  
 tibetanus, 463.  
 tibialis, 53, 117.  
 tickelli, 351, 366, 368.  
 tiga, 347.  
 tigrata, 57.  
 tigrina, 142, 280, 290.  
 tigrinum, 178, 285.  
 tigrinus, 285.  
 tigris, 153, 470.  
 tigroides, 40.  
 tillicera, 111.  
 timæus, 93.  
 timalia, 365.  
 timandra, 59.  
 timera, 107.  
 timoleon, 93, 94.  
 timeta, 117.  
 tinctoria, 96.  
 tineæ, 53.  
 tinunculus, 403.  
 tinoleus, 62, 88.  
 tipula, 49.  
 tiracola, 74.  
 toccolosida, 64.  
 tochina, 169.  
 todis, 60.  
 togata, 135.  
 tolechinia, 100.  
 tolu, 217.  
 tomotrema, 164.  
 toona, 91.  
 toontha, 66.  
 torinia, 151.  
 torpida, 70.  
 torquata, 318.  
 torquatus, 408, 438.  
 torquilla, 349.  
 torrida, 61.  
 torridaria, 63.  
 torta, 128.  
 tortrices, 53.  
 tortuosalis, 65.  
 totanus, 395.  
 toxocampa, 70.  
 toxotes, 203.  
 trabala, 77.  
 trachealis, 22.  
 trachia, 175.  
 trachycomus, 368.  
 traducalis, 55.  
 tragops, 505.  
 tragula, 204.  
 tragulus, 455.  
 trailli, 371.  
 traillii, 128, 154.  
 tramesata, 57.  
 tranquebaricus, 169, 389.  
 transcissa, 61.  
 transectata, 57.  
 transiens, 82, 88.  
 translucidalis, 55.  
 transpectus, 92.  
 transversa, 72.  
 transversalis, 61.  
 transvisalis, 55.  
 trapezium, 67, 146.  
 tremenheerite, 13.  
 tremolite, 13.  
 trepsichrois, 102.  
 treron, 387.  
 triacanthus, 281.  
 triangularia, 63.  
 triangularis, 71, 74, 131.  
 tricarinata, 170.  
 trichiurus, 214.  
 trichogaster, 239.  
 tricholestes, 368.  
 trichophthalmia, 49.  
 trichoptera, 48.  
 trichostoma, 365.  
 trichotropis, 175.  
 tricineta, 109.  
 tricolor, 38, 85, 109, 146.  
 trictenotoma, 113.  
 tricycla, 74.  
 tridacna, 131.  
 tridactyla, 353.  
 tridactylus, 233.  
 trifascialis, 56.  
 trifasciata, 65, 72.  
 trifenestrata, 79.  
 triforis, 154.  
 trigona, 121, 178.  
 trigonella, 134.  
 trigonodes, 66.  
 trigonostigma, 361.  
 trilinearia, 62.  
 trilineata, 59, 62, 149.  
 trilineatum, 259.  
 trilineatus, 241.  
 triloba, 68.  
 trilobatus, 244.  
 trilocha, 80.  
 trilochoides, 77.  
 trimaculatus, 241, 281, 311.  
 trimantesalis, 65.  
 trimeresurus, 313.  
 tringa, 395.  
 trinotaria, 58.  
 triocellata, 53.  
 trionyx, 349.  
 triopas, 94.  
 triostegus, 215.  
 tripartita, 135.  
 triphana, 73.  
 triplicalis, 64.  
 triptogon, 89.  
 tripudians, 308.  
 tripunctata, 94.  
 tripura, 86.  
 trisignata, 56.  
 trispinaria, 61.  
 trispinosus, 25.  
 tristis, 348, 360, 368, 385.  
 trisula, 78.  
 tritia, 144.  
 tritonium, 143.  
 trivina, 153.  
 trivirgatus, 404, 468.  
 trivittata, 87, 339.  
 trochalia, 175.  
 trochalopterom, 367.  
 trochia, 145.  
 trochiloides, 373.  
 trochomorpha, 174.  
 trochus, 169.  
 tropica, 72.  
 tropidonotus, 301.  
 tropidophorus, 327.  
 truncata, 68.  
 truncataria, 63.  
 truncatella, 163.  
 truncatula, 135.  
 trygodes, 51.  
 trygon, 287.  
 trypauchen, 232.  
 tuba, 177.  
 tuberculata, 113, 145, 155.  
 tuberculatus, 48, 142, 295.  
 tuberculimana, 29.  
 tubiferum, 176.  
 tubipora, 49.  
 tukhi, 348.  
 tullalis, 54.  
 tumida, 30.  
 tumilabris, 189.  
 tupaia, 441.  
 turbata, 58, 89.  
 turbellaria, 20.  
 turbida, 66.  
 turbo, 164, 168, 169.  
 turdinus, 362.  
 turdus, 361.  
 turgida, 129, 134.  
 turnix, 391.  
 turricula, 147.  
 turrita, 157.  
 turritella, 157.

turritus, 154.  
 turtur, 388.  
 tusalia, 388.  
 tyana, 53.  
 tytia, 101.  
 tylonycteris, 433.  
 tylotriton, 288.  
 tympanistes, 76.  
 tymponotonos, 154.  
 typhia, 370.  
 typhlops, 298.  
 typus, 254.  
 tyresalis, 55.  
 tytleri, 290, 356, 386.

## U.

ulupe, 306.  
 umbonalis, 167.  
 umbrina, 66.  
 umminia, 67.  
 undata, 84, 145, 472.  
 undatum, 145.  
 undatus, 141.  
 undosa, 174.  
 undularis, 96.  
 undulata, 76, 134, 155,  
 279.  
 undulatus, 282, 351.  
 undulosa, 77, 147.  
 unguiformis, 158.  
 unicolor, 78, 235, 299,  
 303.  
 unifasciatus, 261.  
 unimacula, 84.  
 unio, 130, 131.  
 unistrigata, 68.  
 unitalis, 54.  
 upeneus, 201.  
 upenioides, 203.  
 uppana, 73.  
 upupa, 352.  
 urania, 40.  
 urapteraria, 60.  
 urapteryx, 63.  
 urbanus, 419.  
 urbica, 357.  
 urnula, 167.  
 urophora, 39.  
 urosphena, 372.  
 urotænia, 194.  
 urrua, 406.  
 ursus, 463.  
 urva, 469.  
 usta, 61.  
 ustulata, 69.  
 ustulatella, 52.  
 utergatis, 31.  
 utethesia, 87, 88.  
 uvaria, 57.

## V.

vacans, 103.  
 vacha, 258.  
 vaga, 65.  
 vagabundus, 200.  
 vagalis, 55.  
 vagata, 58.  
 vagesa, 87.  
 vagina, 232.  
 vaillantii, 387.  
 valeria, 104.  
 valida, 163.  
 vamauna, 96.  
 vamuna, 86.  
 vanessa, 97.  
 varana, 86.  
 varanus, 326.  
 varia, 43, 45, 170.  
 variabilis, 142, 155, 233.  
 varialis, 65.  
 varians, 70, 80, 84, 85, 387.  
 varicoloraria, 61.  
 variegata, 47, 57, 78, 150,  
 276.  
 variegatus, 331.  
 varipennis, 43.  
 varius, 39.  
 varnia, 71.  
 varuna, 93, 106.  
 varunaa, 84.  
 varunana, 92.  
 vasara, 91.  
 vasudeva, 96.  
 vasutana, 91.  
 vatama, 80.  
 veda, 97.  
 vedanga, 92.  
 velatum, 381.  
 velifer, 216.  
 velinus, 41.  
 velitra, 42.  
 vellicata, 134.  
 velutinus, 50.  
 venalba, 75, 86.  
 venata, 103.  
 venatrix, 104.  
 veuerupis, 134.  
 venilia, 104.  
 venimaculata, 57.  
 venosa, 78, 83, 87, 88.  
 venosus, 253.  
 ventralis, 393.  
 ventricosa, 155, 163.  
 ventricosus, 150.  
 venulia, 72, 88.  
 venus, 133.  
 venustularia, 61.  
 venustus, 174.  
 veredus, 393.  
 verhuelli, 104.  
 verma, 95.  
 vermiculata, 210.  
 vermiculatus, 151, 235.

vernalis, 409.  
 vernans, 388.  
 vernida, 85.  
 veronicella, 178.  
 verrucifer, 44.  
 verrucosus, 153, 289.  
 versicolor, 42, 148, 334.  
 vertagus, 154.  
 verticillata, 71.  
 vertumnalis, 55.  
 vesbius, 41.  
 vesicularia, 58.  
 vespa, 118, 177.  
 vespertilio, 68, 218, 435,  
 444.  
 vespertinus, 403.  
 verperugo, 431.  
 vesperus, 443.  
 vesta, 102.  
 vestalis, 47.  
 vestitus, 167.  
 veterinorum, 21.  
 vexillum, 128, 140.  
 vibex, 149.  
 vibrissa, 409.  
 vicaria, 61.  
 vicarius, 176.  
 victor, 29.  
 victrix, 88.  
 viculorum, 420.  
 vidura, 93.  
 vielloti, 170, 390.  
 vigen, 76.  
 vigil, 90, 351.  
 vihara, 100.  
 vikasi, 98.  
 vinacealis, 54.  
 vinacearia, 59.  
 vinata, 77.  
 vindusara, 57.  
 violacea, 119, 131, 135,  
 142.  
 viola, 102.  
 viperina, 321.  
 vira, 80.  
 viraja, 99.  
 virens, 350.  
 virescens, 39, 45, 81, 106.  
 virgata, 210, 344.  
 virgatalis, 55.  
 virgatus, 404.  
 virguncula, 83.  
 viridalis, 64.  
 viridanus, 373.  
 viridaria, 61.  
 viridata, 63, 87.  
 viridescens, 247, 282, 368,  
 369.  
 viridiænea, 112.  
 viridifusca, 83.  
 viridiluteata, 60.  
 viridirostris, 39.  
 viridis, 65, 174, 229, 348,  
 352, 354, 375.

viridissima, 370.  
visala, 96.  
vishnu, 77.  
visrava, 95.  
vitellialis, 56.  
vitellus, 153.  
vitessa, 88.  
vithora, 88.  
vitreata, 57.  
vitrosus, 119.  
vittata, 60, 82, 341.  
vittatus, 203, 251, 347.  
vitticostata, 62.  
viverra, 466.  
viverricula, 466.  
viverrina, 472.  
vivia, 349.  
vivida, 382.  
vivipara, 156.  
volans, 444.  
volcanoes, 6.  
volitans, 208.  
volvocivora, 380.  
vulcani, 167.  
vulcanus, 139.  
vulgaris, 45, 102.  
vulnerata, 45.  
vulpinaria, 63.  
vulsella, 127.

### W.

wad, 13.  
waigiensis, 207.  
walbeehmei, 284.  
waldemarii, 147.  
walkeri, 171.  
wallago, 256.  
wallichi, 109.  
warnetfordianus, 164.  
warnfordi, 170.  
wassinki, 195.  
watsoni, 102.  
weinkauffiana, 156.  
westermannia, 71.  
westermannii, 94.

westwoodi, 44.  
westwoodii, 44.  
white ants, 46.  
whitei, 31, 77.  
wicksii, 331.  
wilmeri, 142.  
woodmasoniana, 156, 157.

### X.

xandrames, 62.  
xanthidyma, 70.  
xanthochir, 223.  
xanthodes, 72.  
xanthogastrella, 64.  
xantholenca, 377.  
xanthometopon, 202.  
xanthonotus, 371.  
xanthorhynchus, 359.  
xanthoschistus, 374.  
xanthus, 106.  
xema, 400.  
xenopeltis, 299.  
xenophora, 158.  
xenophrys, 291.  
xenopterus, 283.  
xiphura, 24.  
xylinella, 53.  
xylochroma, 65.  
xylocopa, 122.  
xylophasia, 74.

### Y.

yama, 95.  
yarrellii, 259.  
yuhina, 377.  
yunanensis, 132, 177, 290,  
294, 300, 332, 416, 419,  
422.  
yungipicus, 349.  
yunx, 349.  
ypphthima, 95.

### Z.

zafra, 148.  
zal, 104.  
zanclopteryx, 59.  
zanies, 68.  
zanzebarica, 149.  
zayla, 99.  
zealis, 54.  
zebra, 207, 280.  
zebralis, 55.  
zebrina, 87.  
zebrinus, 164, 301.  
zebronia, 55.  
zeleucus, 106.  
zelmira, 103.  
zemerus, 95.  
zennara, 91.  
zenocles, 106.  
zeroca, 99.  
zeta, 100.  
zethera, 96.  
zethes, 65.  
zeuxidia, 104.  
zeuxippe, 103.  
zeuxis, 144.  
zenzera, 76.  
zibetha, 466.  
zibrinus, 236.  
zierona, 13.  
ziphactes, 96.  
ziziphi, 53.  
zomia, 58.  
zonalis, 126, 148.  
zonalternans, 273.  
zonaria, 149.  
zonata, 122.  
zonatus, 151.  
zonea, 84.  
zonilia, 90.  
zoothera, 363.  
zophoessa, 95.  
zoroaster, 175.  
zosterops, 377.  
zozymus, 31.  
zuleika, 79.  
zulema, 99.  
zygena, 285.

## INDEX.

## PART II.—SYNONYMS.

- abnormis*, 346.  
*abrarus*, 63.  
*acerra*, 172.  
*achatana*, 171.  
*acudalia*, 59, 61.  
*adlias*, 99.  
*alianus*, 92.  
*ænippe*, 104.  
*aquibarbis*, 253.  
*affinis*, 381, 408.  
*afghana*, 294.  
*aguthia*, 60.  
*aglaia*, 102.  
*agrotis*, 73.  
*alanis*, 70, 74.  
*albiangularia*, 60.  
*albicans*, 77.  
*albirictus*, 378.  
*albiventris*, 391.  
*albogularis*, 400.  
*albopunctata*, 210.  
*aligans*, 68.  
*altiroians*, 432.  
*altum*, 196.  
*amabilis*, 353.  
*amasene*, 103.  
*amauroptera*, 397.  
*amba*, 103.  
*amblypodia*, 94.  
*amherstii*, 406.  
*ampla*, 77.  
*ampulliformis*, 157.  
*amydona*, 77.  
*amygdatas*, 177.  
*anabatoïdes*, 243.  
*anailis*, 57.  
*anarta*, 99.  
*anchorago*, 39.  
*andamana*, 99, 147.  
*andamanensis*, 173, 290,  
 386, 400, 425, 476.  
*andamanicus*, 176.  
*androgeos*, 106.  
*angerona*, 68.  
*angulifera*, 155.  
*anisodes*, 58, 59, 66.  
*annuligeralis*, 54.  
*antica*, 83, 84.  
*anticyro*, 83.  
*antricola*, 429.  
*apiculatus*, 429.  
*approximata*, 83.  
*arakona*, 337.  
*arata*, 132.  
*areca*, 94.  
*arestha*, 83.  
*argus*, 191.  
*arrundi*, 80.  
*arvicola*, 417.  
*aspilates*, 62.  
*assamensis*, 413, 423.  
*assimilis*, 384, 387.  
*astorion*, 106.  
*ater*, 435.  
*atratus*, 429.  
*atricallosus*, 176.  
*atricapillus*, 416.  
*atronuchalis*, 393.  
*attacus*, 80.  
*aurantiacus*, 416.  
*auratus*, 435.  
*aurcola*, 381.  
*aureus*, 477.  
*auris-diunæ*, 152.  
*aurita*, 429.  
*aurola*, 103.  
*austenianus*, 432.  
*australis*, 437.  
*autonoe*, 103.  
*auxima*, 62.  
*bagio*, 278.  
*balteatus*, 164.  
*basalis*, 77.  
*basilaris*, 73.  
*bathycles*, 105.  
*barbei*, 415.  
*belangeri*, 434.  
*belgoræa*, 78.  
*bellatrix*, 88.  
*bengalensis*, 321, 365.  
*berdmorca*, 291.  
*berdmorci*, 338, 418.  
*bhascara*, 83.  
*biauritus*, 214.  
*bicolor*, 244, 306.  
*bicornis*, 350.  
*bido*, 405.  
*bifasciata*, 66.  
*bigshyi*, 175.  
*biliratus*, 165.  
*bilobus*, 393.  
*biocellatus*, 200.  
*bithia*, 59, 61.  
*bivittatus*, 293.  
*blainvillei*, 143.  
*blanfordi*, 391, 435.  
*blennus*, 166.  
*blythii*, 386, 413, 432,  
 453.  
*boarmia*, 61.  
*boarula*, 374.  
*bocourti*, 412.  
*boisduravii*, 100.  
*bombyx*, 77, 82.  
*bontoo*, 190.  
*borealis*, 373.  
*borneocensis*, 416.  
*botys*, 54, 56.  
*brachylophus*, 347.  
*brachyota*, 429.  
*brachyotus*, 406.  
*brachypterus*, 405.  
*brahma*, 407.  
*brassica*, 104.  
*braziliana*, 361.  
*brevicaudatum*, 424.  
*brevicaudus*, 437.  
*brevipalpis*, 70.  
*brookeanus*, 347.  
*brunneus*, 418, 475.  
*bubo*, 68.  
*bulia*, 140.

- burmanica*, 384.  
*burmanicus*, 348.  
*bursa*, 143.  
*butalis*, 382.  
*carulecula*, 372.  
*carulescens*, 135, 105, 111.  
*calidus*, 102.  
*caliginosus*, 135.  
*callula*, 292.  
*calobates*, 139.  
*cancellatum*, 143.  
*caniceps*, 408.  
*canorufa*, 74.  
*cantori*, 437.  
*capillulata*, 168.  
*capitata*, 63.  
*carbonarius*, 477.  
*castaneus*, 421, 434.  
*cassida*, 103.  
*catocaloides*, 88.  
*caulata*, 58.  
*caudatus*, 438.  
*celesdera*, 58.  
*chalciope*, 66.  
*chaptis*, 213.  
*cheiropus*, 438.  
*chinensis*, 371.  
*chizala*, 63.  
*chlamsys*, 177.  
*chryseis*, 104.  
*chrysonotus*, 415.  
*cineraceus*, 429.  
*cinereiventris*, 369.  
*cinereocapilla*, 375, 382.  
*cinnamomarus*, 413, 418.  
*cinyra*, 95.  
*cirrædia*, 70.  
*clytia*, 105.  
*cnothocampa*, 81.  
*coitor*, 213.  
*communis*, 402.  
*concinna*, 143.  
*concolor*, 77, 415.  
*confinis*, 99.  
*conger*, 278.  
*corallina*, 362.  
*corinca*, 53.  
*coromandelianus*, 178.  
*coromandelicus*, 432.  
*coromandra*, 432.  
*coronis*, 103.  
*corvina*, 212.  
*costellifera*, 144.  
*cotufa*, 67.  
*cramboides*, 64.  
*cresphrontes*, 105.  
*cribraria*, 87.  
*cristatus*, 390, 396.  
*crossæi*, 452.  
*crucata*, 81.  
*cryptolopha*, 382.  
*cryptospira*, 168.  
*cuculus*, 359.  
*culicula*, 69.  
*cunulifera*, 67.  
*cursa*, 144.  
*cyanostigmatoïdes*, 190.  
*cyanostoma*, 113.  
*cyclophorus*, 165.  
*cynopterus*, 421.  
*dactylina*, 138.  
*damacensis*, 395.  
*dasychira*, 83.  
*dauricus*, 386.  
*darisoni*, 368, 377.  
*deceptura*, 63.  
*decoraria*, 60.  
*decumanoides*, 418.  
*decussatula*, 157.  
*degenerella*, 64.  
*dekan*, 421.  
*delesserti*, 367.  
*delibata*, 175.  
*dilatata*, 81.  
*diacanthus*, 213.  
*diadema*, 428.  
*diardii*, 424.  
*diceruroides*, 359.  
*diffusus*, 371.  
*digona*, 156.  
*dinara*, 81.  
*dione*, 103.  
*discoceæ*, 69.  
*discriminata*, 60.  
*disjunctalis*, 54.  
*dispar*, 143, 190.  
*doliaris*, 156.  
*doubledayi*, 99.  
*drepanoides*, 66.  
*drepanoides*, 67.  
*drymocapthus*, 365.  
*drymonia*, 81.  
*dubius*, 375, 377, 419.  
*duflacensis*, 364.  
*dukhovensis*, 429.  
*durcusa*, 103.  
*duvaucellii*, 424.  
*dysopes*, 438.  
*edwardsii*, 423.  
*eleutherura*, 424.  
*elongata*, 140.  
*elphos*, 61.  
*emys*, 338.  
*enomocides*, 65.  
*epimuta*, 94.  
*episcopus*, 151.  
*erato*, 95.  
*erchanorpha*, 63.  
*erythrocephalus*, 352.  
*erythronolus*, 416.  
*etolus*, 94.  
*eubolia*, 57.  
*eupactes*, 84.  
*eulolmos*, 403.  
*evacalis*, 54.  
*exempta*, 69.  
*exterior*, 68.  
*fairbankia*, 157.  
*fulcata*, 83.  
*fulcatilla*, 83.  
*fulviculata*, 87.  
*fulih*, 91.  
*feldeni*, 347.  
*ferrugiceps*, 352.  
*feldeni*, 403.  
*filosa*, 156.  
*finlaysoni*, 412.  
*finshii*, 409.  
*flava*, 375.  
*flavulus*, 434.  
*flaviceps*, 341.  
*flavicollis*, 385.  
*flavicristata*, 378.  
*flaviventris*, 373.  
*flavularis*, 385.  
*flavo-olivaceus*, 373.  
*franklini*, 349.  
*frumentum*, 172.  
*fuciphaga*, 358.  
*fulgens*, 429.  
*fuliginosa*, 168, 382.  
*fulvipes*, 433, 437.  
*fulviventris*, 375.  
*fulvus*, 365.  
*fuscus*, 149.  
*galathea*, 104.  
*gazorialis*, 55.  
*gelocheidon*, 401.  
*gemetra*, 60.  
*germani*, 412.  
*giganteus*, 418.  
*ginea*, 67.  
*glaphyra*, 104.  
*glaucostriga*, 75.  
*glaucus*, 190.  
*gliceria*, 104.  
*gloriosa*, 155.  
*glyphidion*, 243.  
*glyphodes*, 55.  
*graciosa*, 78.  
*griffithii*, 417, 441.  
*griseiceps*, 368.  
*griseulus*, 373.  
*griscus*, 385, 394, 428.

- gutturatis*, 347, 356.  
*haliartus*, 98.  
*hamata*, 67.  
*hardwickii*, 417.  
*hariola*, 175.  
*harmonia*, 68.  
*haughtoni*, 164.  
*helesidotalis*, 86.  
*holferi*, 102.  
*heliciformis*, 157.  
*hemilophus*, 347.  
*hemirhoda*, 72.  
*heptadactylus*, 188.  
*herculea*, 155.  
*hesperia*, 92.  
*heteropterus*, 235.  
*hildebrandi*, 368.  
*himalayensis*, 378.  
*hippia*, 101.  
*hipposideros*, 428, 429.  
*hiva*, 103.  
*hodgeoni*, 354, 370.  
*hoerreni*, 189.  
*hounfragi*, 191.  
*horsfieldii*, 394, 424.  
*humeralis*, 168.  
*humilior*, 389.  
*hyblecella*, 71.  
*hyledactylus*, 293.  
*hylocharis*, 380.  
*hyloterpe*, 380.  
*hypatala*, 93.  
*hyperythra*, 62.  
*hyperythrus*, 414.  
*hypopyra*, 68.  
*idonea*, 68.  
*ignitus*, 390.  
*ilita*, 83.  
*illcta*, 74.  
*imbricatus*, 432.  
*immodesta*, 69.  
*imprimata*, 59, 61.  
*impudicus*, 387.  
*inchoata*, 71.  
*inconclusa*, 61.  
*indica*, 104, 145, 350, 371, 417.  
*indicus*, 178, 371, 373, 378.  
*indopicus*, 347.  
*indra*, 103.  
*infida*, 71.  
*infumata*, 381.  
*inglisi*, 366.  
*ingura*, 71.  
*innotata*, 401.  
*inornata*, 74, 393.  
*insignata*, 75.  
*insignis*, 429.  
*insolens*, 387.  
*insulsa*, 75.  
*intermedia*, 378, 386.  
*intermedius*, 369, 396.  
*iravatica*, 157, 339.  
*isana*, 95.  
*ismene*, 96.  
*jacintha*, 98.  
*javanica*, 401.  
*javanicus*, 432.  
*javanus*, 453.  
*jerdoni*, 347, 365, 401, 404.  
*johnius*, 213.  
*joriana*, 67.  
*kamorta*, 105.  
*keraudreni*, 412.  
*kerivoula*, 435.  
*knorii*, 168.  
*kohlii*, 434.  
*kok*, 417.  
*labiata*, 432.  
*labrichthys*, 244.  
*labuanensis*, 429.  
*laciniatum*, 143.  
*latabilis*, 67, 68.  
*lagoptera*, 67.  
*lalisos*, 96.  
*lankadica*, 428.  
*laomedon*, 106.  
*larissa*, 103.  
*lavratus*, 427.  
*lasiopterus*, 432.  
*lasiura*, 436.  
*lasiurus*, 436.  
*lathamii*, 409.  
*latinargo*, 100.  
*leai*, 164.  
*lebeda*, 77.  
*lecythis*, 157.  
*leciophis*, 175.  
*leonina*, 66.  
*leptocoma*, 361.  
*leptura*, 412.  
*leschenaultii*, 425.  
*lethe*, 89.  
*lettia*, 407.  
*leucocephalus*, 423.  
*leucogaster*, 412.  
*leucoma*, 83.  
*leucomystax*, 294.  
*leucoptera*, 398.  
*leucopterus*, 386.  
*leucura*, 383, 412.  
*libitina*, 103.  
*liguaria*, 59, 61, 90.  
*limacodes*, 78.  
*lineata*, 350.  
*lineatum*, 390.  
*lineolation*, 224.  
*lineola*, 81.  
*lithofalco*, 403.  
*lithosia*, 64.  
*lobipes*, 435.  
*longicauda*, 429.  
*longicaudatus*, 372.  
*longipes*, 393.  
*lyca*, 94.  
*lycopodia*, 66.  
*ladatrix*, 71.  
*lunula*, 80.  
*luticus*, 434.  
*luzoniense*, 424.  
*macarta*, 59, 61.  
*macracanthus*, 194.  
*macroclis*, 472.  
*macrotis*, 441.  
*macrocus*, 416.  
*macruroides*, 412.  
*macurus*, 432.  
*maculosum*, 132.  
*magica*, 67.  
*maguirostris*, 365, 408.  
*magnus*, 432.  
*major*, 399.  
*malabaricus*, 418.  
*malaccensis*, 352, 409.  
*malayanus*, 359.  
*mandalayensis*, 130.  
*manoi*, 419.  
*marginata*, 177, 424.  
*marginatus*, 425.  
*marica*, 366.  
*marshallarum*, 350.  
*masoni*, 170.  
*mastrucata*, 70.  
*marula*, 68.  
*megapteralis*, 54.  
*megasoma*, 77.  
*melanocephala*, 375.  
*melanoleuca*, 372.  
*melanophila*, 84.  
*melanorhynchus*, 409.  
*melanostoma*, 168.  
*melanotus*, 424.  
*mellita*, 177.  
*merguensis*, 175, 178.  
*mestlela*, 66.  
*meyeri*, 433.  
*miana*, 74.  
*micra*, 53, 72.  
*microptera*, 385.  
*minus*, 366.  
*minuta*, 148.  
*mirafra*, 385.



- mollis*, 68.  
*monesusalis*, 54.  
*moormensis*, 473.  
*mordax*, 432.  
*moria*, 127.  
*morta*, 89.  
*moukoti*, 378, 415.  
*moypinensis*, 435.  
*murinus*, 429.  
*musculus*, 419.  
*mygdalia*, 68.  
*nakula*, 94.  
*nanus*, 404.  
*natatrix*, 292.  
*naticoides*, 157.  
*neglecta*, 375.  
*nemorivagus*, 418.  
*neombo*, 103.  
*nerissa*, 103.  
*nesokia*, 417.  
*neotoma*, 417.  
*nicobaricus*, 89, 290.  
*nicobarica*, 92, 93.  
*nicobaricus*, 113, 164, 408, 418.  
*nicobariensis*, 97.  
*nigropileus*, 369.  
*nida*, 92.  
*niorina*, 96.  
*nipalensis*, 363, 468.  
*nireus*, 293.  
*nitidus*, 373.  
*nireiguttilla*, 53.  
*niriaper*, 66.  
*nobilis*, 428.  
*noctua*, 68, 69.  
*noctulina*, 436.  
*noctulinus*, 434.  
*non-striata*, 384.  
*noresgicus*, 418.  
*norahollandia*, 402.  
*nyctemerata*, 64.  
*nycticejus*, 434.  
*oblitrans*, 90.  
*obscurior*, 356.  
*obstataria*, 59, 61.  
*obumbrata*, 67.  
*occipitalis*, 380.  
*ocellata*, 338, 391.  
*ochrogenys*, 406.  
*octona*, 171.  
*olivacea*, 144.  
*opras*, 171.  
*ophisma*, 67, 68.  
*ophiusa*, 67.  
*orientalis*, 90, 393, 404, 465.  
*otolithus*, 214.  
*otopoma*, 166.  
*otas*, 406.  
*pachysama*, 424.  
*pallida*, 77, 435.  
*palmarium*, 357.  
*paludinoides*, 158.  
*pandia*, 91.  
*panope*, 105.  
*parcipennis*, 68.  
*parisuthi*, 61.  
*parma*, 130.  
*partita*, 53.  
*passalus*, 113.  
*pastor*, 386.  
*paubi*, 171.  
*personii*, 436.  
*pectoralis*, 349.  
*pegana*, 441.  
*peganensis*, 131, 168, 443.  
*pembertonii*, 415.  
*penicillaria*, 62, 71.  
*penicillatus*, 429.  
*peninsignata*, 60.  
*perchal*, 418.  
*perfidissa*, 67.  
*perigonis*, 90.  
*peruiger*, 427.  
*peronii*, 331.  
*petrosa*, 173.  
*phaeoceph*, 348.  
*phalana*, 58, 68.  
*phalana-noctua*, 66, 69.  
*phanasalis*, 54.  
*phayrei*, 365, 391, 416, 479.  
*philippensis*, 393.  
*philippinensis*, 430, 437.  
*philomela*, 380.  
*phylloerhamphus*, 372.  
*phylloorkina*, 429.  
*picus*, 416.  
*picta*, 75.  
*picus*, 347.  
*pieis*, 104.  
*pinguis*, 133.  
*pipistrillus*, 432.  
*plagiata*, 77.  
*platycrata*, 58.  
*pluto*, 416.  
*pluvialis*, 393.  
*poaphila*, 67.  
*pocusaria*, 68.  
*polydesma*, 70.  
*pomona*, 69.  
*porsenna*, 103.  
*pradiota*, 65.  
*præcognitus*, 365.  
*prasina*, 77.  
*preparus*, 377.  
*proterus*, 432.  
*protoparce*, 90.  
*proculus*, 417.  
*pternopterus*, 435.  
*pteropis*, 424, 425, 426.  
*ptiloskelos*, 406.  
*pulexerrimus*, 293.  
*pullus*, 176.  
*pulcratus*, 432.  
*punctularia*, 384.  
*pusilla*, 364, 383.  
*pusillus*, 369, 427.  
*pusillifera*, 83.  
*pyctoris*, 417.  
*pygæus*, 369.  
*pygæus*, 405.  
*pyrac*, 104.  
*pyriniata*, 66.  
*pyrronius*, 424.  
*pyrrhops*, 378.  
*quadristrigata*, 69.  
*rafflesi*, 416.  
*raja*, 100.  
*rangomensis*, 379.  
*recepta*, 57.  
*recurrens*, 71.  
*renigia*, 67, 68, 70.  
*remensis*, 67.  
*repercussa*, 175.  
*retifera*, 168.  
*retinalis*, 55.  
*rhinolophus*, 428, 429.  
*rhodophila*, 372.  
*ricine*, 83.  
*rigema*, 83.  
*rochata*, 93.  
*romieri*, 176.  
*rusca*, 143.  
*roseifascia*, 72.  
*rustratus*, 426.  
*rouxi*, 403, 427.  
*rubiginosus*, 177.  
*rufescens*, 177, 373, 382, 418.  
*ruficeps*, 366.  
*rufipennis*, 360.  
*ruficentris*, 359.  
*rufogularis*, 416.  
*rufonigra*, 416.  
*rufulus*, 364.  
*rapula*, 64.  
*saccata*, 174.  
*salaris*, 235.  
*salomensis*, 54.  
*sanguinea*, 82.  
*sarawakensis*, 416.  
*saturata*, 377.

- saturatus*, 403.  
*saxea*, 158.  
*schisticeps*, 375.  
*schistifusca*, 58.  
*schistostelis*, 172.  
*schwartzi*, 373.  
*scitaria*, 66.  
*scotophilus*, 432, 433.  
*scutellatus*, 408.  
*scydra*, 86.  
*sedera*, 100.  
*seebolmi*, 373.  
*sejunctaria*, 65.  
*sele*, 212.  
*semiclusaria*, 63.  
*seminudus*, 425.  
*semistriata*, 384.  
*sericea*, 68.  
*serotinus*, 432.  
*serratizona*, 164.  
*setifer*, 418.  
*siamensis*, 413.  
*signata*, 65.  
*siletti*, 81.  
*silhetensis*, 89.  
*similaria*, 59.  
*similis*, 413.  
*sinensis*, 387.  
*sipyla*, 66.  
*sita*, 96.  
*siva*, 77.  
*soaresi*, 231.  
*soldado*, 212.  
*solida*, 140.  
*solitaria*, 363.  
*sparus*, 211.  
*speciosus*, 475.  
*spectabilis*, 77.  
*sphingomorpha*, 66.  
*spilurus*, 204.  
*splendens*, 413.  
*splendidus*, 413.  
*spoliata*, 74.  
*steiria*, 69.  
*strenuus*, 359.  
*striatus*, 359, 383.  
*subfasciata*, 69.  
*sublucra*, 85.  
*subminuta*, 394.  
*sub-moniliger*, 382.  
*subnotata*, 78.  
*subtractata*, 60.  
*subundulata*, 384.  
*subunita*, 67.  
*subvitrea*, 83.  
*suffusa*, 80, 83.  
*sufta*, 96.  
*sultaneroo-kuntze*, 211.  
*sultaneus*, 347.  
*sumatrensis*, 421.  
*summana*, 189.  
*sunia*, 407.  
*superciliaris*, 385.  
*superstriata*, 384.  
*susceptaria*, 62.  
*swinhoei*, 352, 428.  
*sympis*, 67.  
*tangalunga*, 466.  
*targalia*, 71.  
*tarila*, 95.  
*tegna*, 71.  
*temenuchus*, 386.  
*temminckii*, 473.  
*tetragonus*, 141.  
*thatera*, 60.  
*theobaldianus*, 176.  
*thermesta*, 66.  
*thysalis*, 56.  
*thya*, 104.  
*thymbræus*, 94.  
*tibetanus*, 390.  
*tickelli*, 173, 366.  
*tickelliæ*, 382.  
*tiga*, 347.  
*tigrini*, 67, 389.  
*tisiphone*, 96.  
*tittheachilus*, 424.  
*torquata*, 149.  
*torquatus*, 364.  
*transducta*, 66.  
*triangulata*, 70.  
*trifolium*, 430.  
*tridamellaris*, 175.  
*trilatitoides*, 435.  
*trilineata*, 62.  
*trisula*, 83.  
*triton*, 143.  
*tuberculatum*, 154.  
*tumida*, 142.  
*typhon*, 397.  
*tylleri*, 381, 408, 469.  
*umbrosa*, 67.  
*undifera*, 84.  
*univoculis*, 55.  
*variolosa*, 70.  
*vastata*, 57.  
*venusta*, 84.  
*venustum*, 77.  
*vespertilio*, 432, 434.  
*vesperugo*, 432.  
*virbia*, 66.  
*virescens*, 361.  
*virgaurea*, 93.  
*virginicus*, 393.  
*viridifrons*, 387.  
*viridipennis*, 373.  
*viridis*, 157, 370.  
*vitruoides*, 173.  
*vulgaris*, 429.  
*waldeni*, 378.  
*wallichii*, 77.  
*whitleyi*, 407.  
*xanthochlora*, 377.  
*xantholema*, 350.  
*xanthopogon*, 90.  
*xanthopygius*, 347.  
*xiphis*, 103.  
*yunnanensis*, 368, 427.  
*zebronia*, 54.  
*zelnicra*, 103.  
*zoilus*, 94.  
*zuleika*, 84.

END OF VOL. I.





QH183 .M38 1883 v. 1  
Mason, Francis Burma its people and pro  
3 5185 00082 0256

